American Machinist
JULY 17, 1947
McGRAW-HILL MAGAZINE OF METALWORKING
In this issue
BRINELL vs. MACHINABILITY
TINNERMAN BUILDS MORALE
EFFECTIVE LAYOUT & HANDLING

How to raise a family of five—on ONE machine!

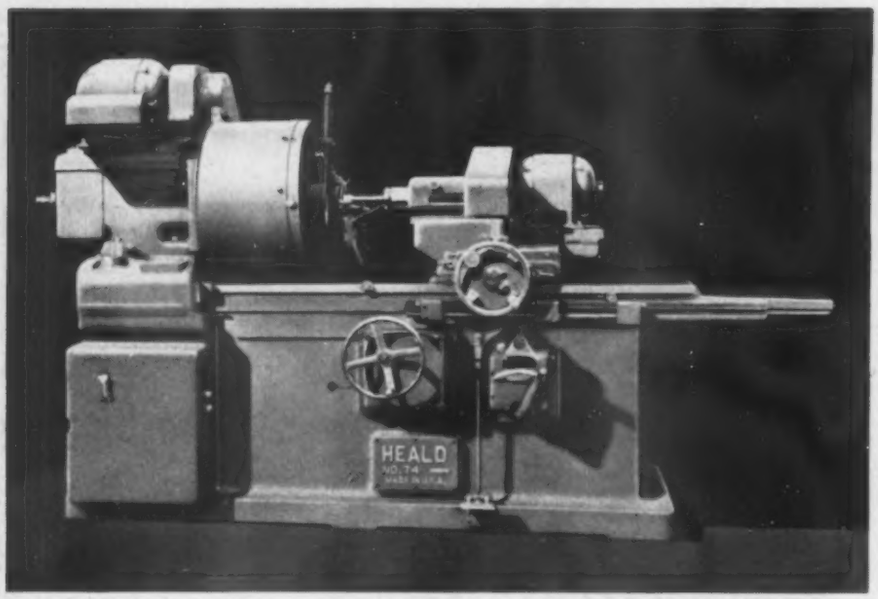
Another example of how Heald engineering solved a special problem—with a saving to the customer

ONE OF OUR CUSTOMERS wanted a machine on which he could grind a whole family of valve bodies—five widely different sizes in all. What he had in mind was a fully automatic machine with several complicated attachments.

Heald engineers analyzed the work to be done—found that although tolerances were close, production requirements remained relatively low. So instead of recommending an automatic machine with many attachments, they advised using a simpler, less expensive model—a Heald No. 74 Plain Internal Grinding Machine. The customer bought it—today finds it completely satisfactory.

In this case, as in thousands of others, Heald engineers are more interested in recommending the *right method* of machining than in selling a particular machine. For every job, we find, is different—and each has its own solution.

Perhaps the solution of your particular precision finishing problem may not cost as much as you think. A Heald application engineer will be glad to advise you—at no obligation, of course. Get in touch with him at the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.



● The Heald No. 74 Internal—a large, versatile grinding machine with ample capacity for handling all kinds of work. It can be arranged as a plain machine, or with Size-Matic and Gage-Matic automatic sizing controls—for a completely automatic grinding cycle.

HEALD

means more precision . . . less cost

Branch Offices in Chicago • Cleveland • Dayton Detroit • Indianapolis • Lansing • New York

INTERNAL AND SURFACE GRINDING MACHINES | BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

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Member of the Associated Business Papers and the Audit Bureau of Circulations.

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A. Return postage guaranteed.

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PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cables: "McGRAW-HILL, NewYork"

James H. McGraw, Jr., President; James H. McGraw, Founder and Honorary Chairman; Curtis W. McGraw, Senior Vice-President and Treasurer; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President; Joseph A. Gerardi, Secretary; J. E. Blackburn, Director of Circulation.

Chips and Quips

Spic and Span . . . In the super-precision department, The Fafnir Bearing Company, New Britain, Conn., ball bearings are built to ultra-close tolerances for such equipment as extremely high-speed spindles. With daily vacuum cleaning and mopping, floors are kept more spotless than a housewife's; painted machinery is cleaned daily; the ceiling is specially covered, and other precautions are taken, all primarily so no speck of foreign material may get into bearings made here. Even an ordinary wiping cloth is taboo; silk, rayon or nylon rags only are used—they cause less lint. All employees who handle bearings in assembly and inspection must use special hand creams to retard perspiration, which might cause rust. This Kodachrome of the grinding section was taken for *American Machinist* by Ray Granquist, Fafnir photographer.

Presses at Work . . . A mechanical pencil represents many fabrication problems because of quantity, costs and size. John W. Dean, Jr., general works manager for Eversharp, acceded to our request for a typical solution, describes the tricks in making the little 3-jaw clutch that feeds lead. Eversharp makes 'em at 25,000 per day by punching in the slots, then shaving off the burr. . . . For presswork contrast, Chester Ricker tells how Northrop hot-forms magnesium plate for aircraft, electrically dimples it, then assembles by automatic welding. . . . C. L. West, vice president of Electric Furnace, goes into selection and application of brazing media as the second installment of his 3-part electric-furnace brazing. Next issue he helps you select and operate the furnace.

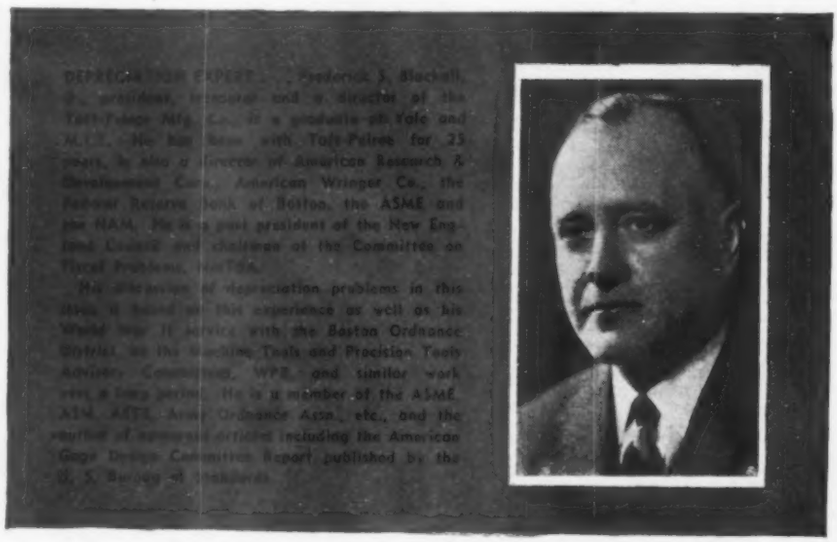
Morale Building . . . Tinnerman Products Co. has a bulletin-board method of building employee morale that we thought you'd want to know more about. The problem is that Tinnerman speed nuts and similar products are not consumer products, although they form parts of many. Now Tinnerman tells employees where the pieces they are making will go, reports improved employee reaction.

Brinell Unmasked . . . Dr. Georg Schlesinger, world-famed expert on machinability, gave us a special report on testing six months ago. Countered a reader, "Why not use Brinell hardness, as we have been doing?" We passed the question to Dr. Schlesinger, who with his customary thoroughness, takes the subject apart in our report.

Operator Ideas Help . . . To show what operator suggestions can do toward improving processes—if the operators are given a chance—we describe three changes reported by G.E., one on a multi-slide machine, one for boring irregular inside contours, one for gaskets.

Handling as a Key . . . Materials handling can make a big difference in costs too. So we tell how Square D conveyorized for straight-line handling through wash and paint operations in switchbox manufacture.

Coming . . . Our special report for July 31 will be "Cutting Fluids," a subject of interest to most readers. Also there'll be, as our pre-Show report, the first half of our preview of new machining developments. . . . Following a previous special report is an article describing mechanized forging presses. . . . John Nylen of Nylen Products describes his 6-grinder, 3-lapper line for centerless finishing of 1700-2600 replacement piston pins per hour. . . . Floyd Bliven, supervisor of salvage for the new Erie G. E. plant, explained how standardized materials handling simplifies and expedites production. . . . Federico Strasser of Santiago, Chile, tells about an auxiliary stripper to prevent punch breakage in a small piercing die; G. M. Bleakley of Westinghouse shows how to approximate true dish surfaces and thus speed mold drawings. . . . And Gordon Murphy, plant supt. for Eversharp, describes a 14-station progressive die that turns out lead-feed clutches for mechanical pencils.



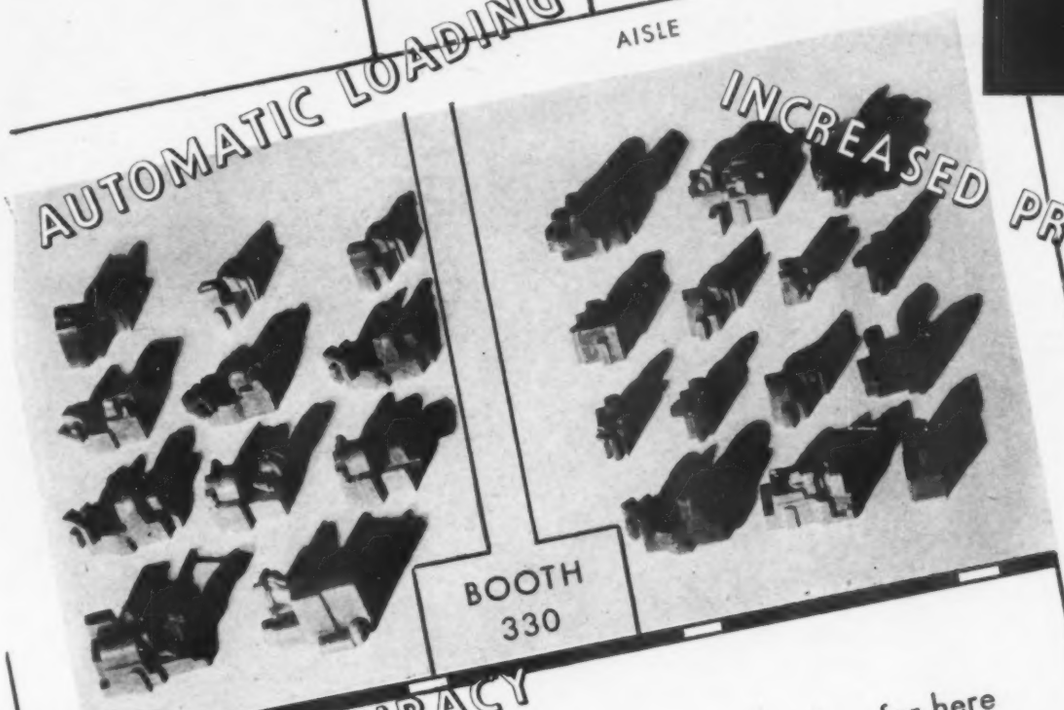
COMING EVENTS CAST THEIR SHADOWS.

MACHINE TOOL SHOW
CHICAGO SEPT. 17-26

AUTOMATIC LOADING

AISLE

INCREASED PRODUCTION



BOOTH 330

GREATER ACCURACY

AISLE

AISLE

BOOTH 330—The booth to be remembered . . . for here in the space Gleason's have provided to display our new machines, the accent is on related equipment . . . units of machinery . . . for efficient, increased production at lower cost. Never before have these phrases more adequately foretold the many improvements brought forth by Gleason engineers to guarantee more goods for more people at lower cost.

AISLE

GLEASON *Works*
1000 University Avenue
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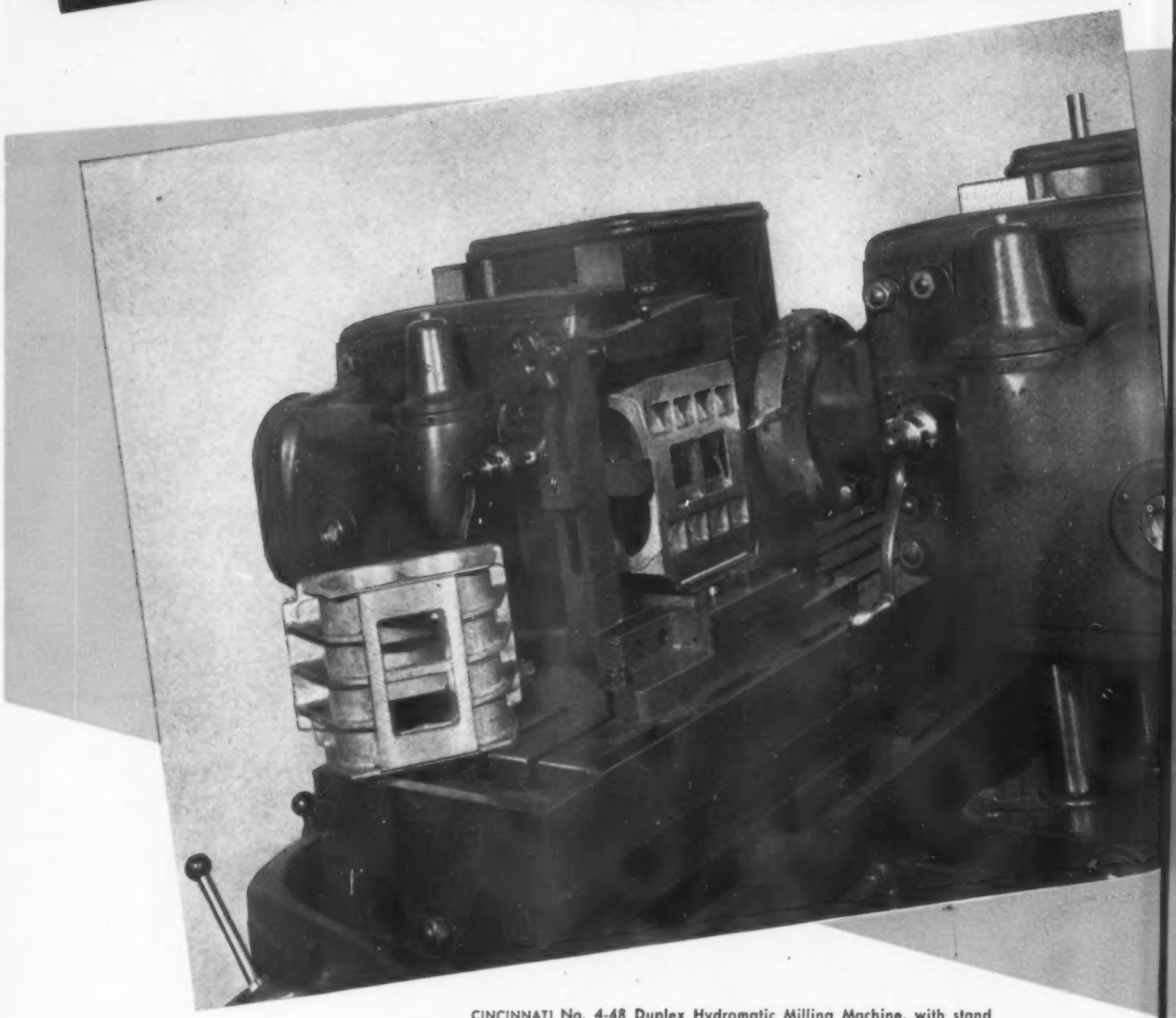
CINCINNATI HYDROMATIC

TAKES A *HIGH SPEED*

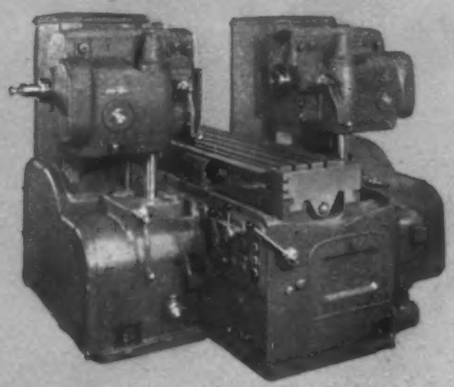


CINCINNATI No. 4-48 Duplex Hydromatic Milling Machine, with standard high spindle speed range of 137 to 1000 r.p.m. and fixture and sintered carbide face mills by Cincinnati Application Engineers, for milling two sides of aluminum crankcases in one pass.

THE CINCINNATI MILLING

MILLING MACHINES

CARBIDE MILLING CUT 13" WIDE IN ONE PASS



CINCINNATI No. 4-48 Duplex Hydromatic Milling Machine. This machine is available in plain and duplex styles, and in 18 sizes each. Catalog M-1372-1 contains complete information.

Take a milling cut 12¾" wide, complicated by a ⅝" shoulder at one end, and you have the formula for a tough milling job, even though the material is aluminum. The crankcases on the machine table at the left conform to this formula, and the No. 4-48 CINCINNATI Duplex Hydromatic, with tooling by Cincinnati Application Engineers, proved to be the solution to the milling operation.

> In one pass, the machine high speed carbide mills two opposite sides of these crankcases to a smooth finish and flat surface, at the rate of 30 per hour.

CINCINNATI Hydromatics have what it takes for high speed carbide milling: heavy construction throughout, with square gibbed table ways . . . they take motors up to 50 hp . . . table feed automatically varied to suit the job . . . wide helical and spiral bevel spindle drive gears . . . extra large bull gear for flywheel effect . . . choice of seven ranges of spindle speeds. You may obtain more information on CINCINNATI Hydromatics by writing for catalog M-1372-1.

See the CINCINNATI MILLING DISPLAY at the MACHINE TOOL SHOW, Chicago, Sept. 17-26

MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

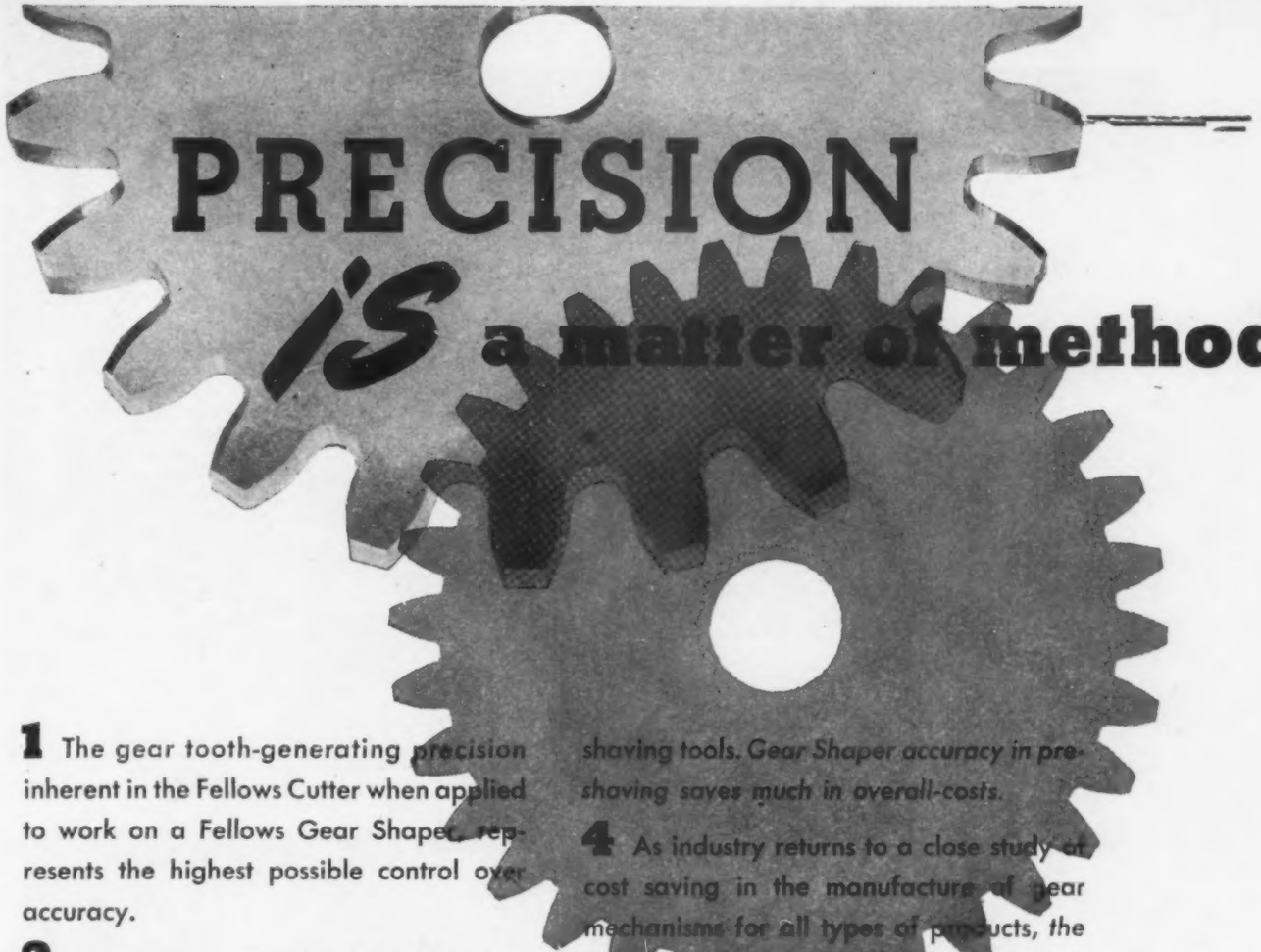
GEAR

Fellows 6A-type Gear Shaper for cutting external and internal spur and helical gears. A most versatile machine for cutting gears and kindred parts.

The Fellows Gear Shaper Line Includes:

- ★ 7-and 7A-types for spur and helical gears up to 7 inches pitch diameter.
- ★ 6A-type for work to 18 inches pitch diameter.
- ★ 6-type for spur and helical gears up to 35 inches pitch diameter.
- ★ 6-type Models Z and Y for large shank gears and large internal gears.
- ★ No. 30 Gear Shaper for cutting coarse-pitch external and internal spur gears.
- ★ No. 48 Gear Shaper for cutting internal spur and helical gears.
- ★ 100-Inch Gear Shaper for cutting external and internal spur gears.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR



PRECISION *is* a matter of method

1 The gear tooth-generating precision inherent in the Fellows Cutter when applied to work on a Fellows Gear Shaper, represents the highest possible control over accuracy.

2 For gears on which finish-tooth-cutting is the final machining operation, the Gear Shaper pays an extra dividend in maintaining a standard of accuracy which permits truly interchangeable assemblies. *Rejects are minimized.*

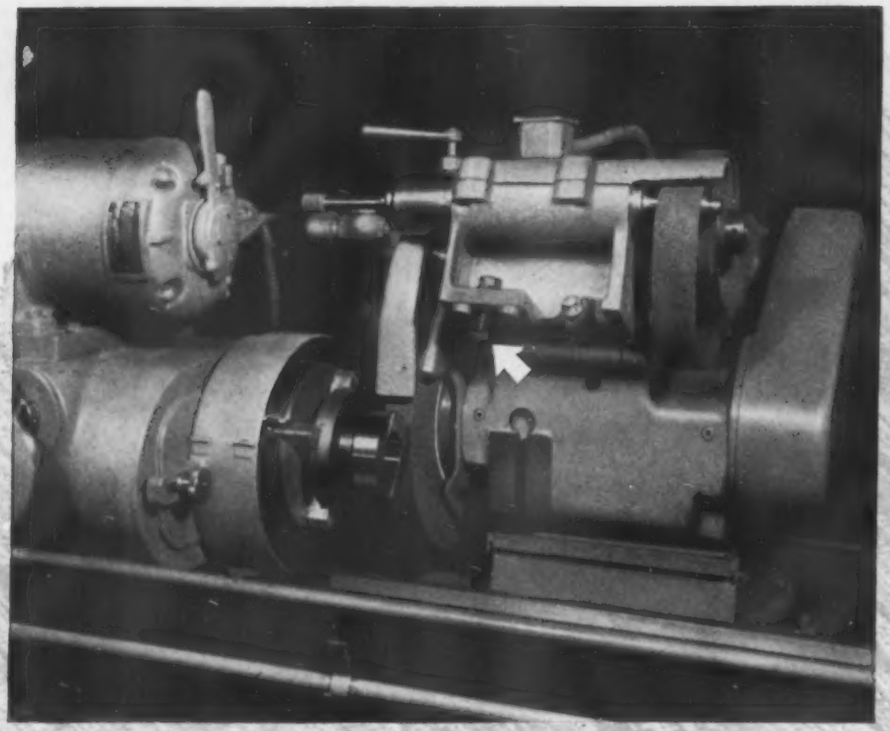
3 As a pre-shaving operation, finish cutting on the Gear Shaper holds to limits which increases the life of ultra-precise shaving tools. *Gear Shaper accuracy in pre-shaving saves much in overall-costs.*

4 As industry returns to a close study of cost saving in the manufacture of gear mechanisms for all types of products, *the Gear Shaper's inherent precision will be found to be a cost saving asset.*

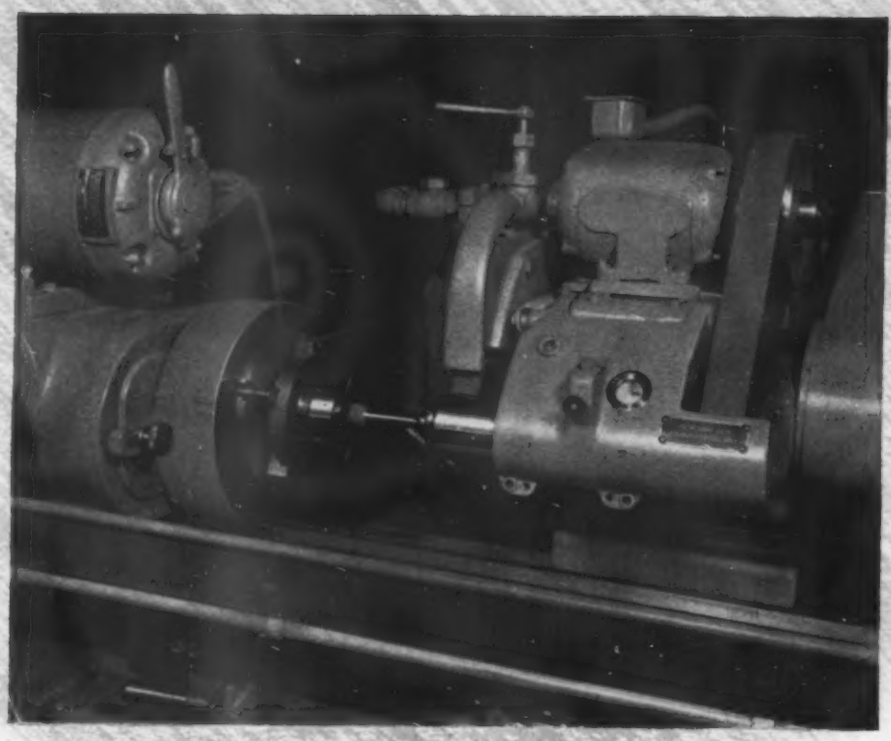
For a complete outline of Fellows gear cutting equipment, we suggest that you ask for a copy of "The Fellows Method". Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.

Fellows

FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR



Internal grinding head of CINCINNATI FILM-ATIC 12" Hydraulic Universal, swiveled up and out of the way for an externally ground part held in a chuck. For internal grinding operations it is pulled down and one hold-down bolt, indicated by the arrow, is tightened. That's all there is to it.



The same internal head in grinding position. It has individual motor drive; belt always in place. If the design of the part permits, external and internal grinding operations may be completed in one chucking. Then there's no doubt about concentricity; no chance for error.

CINCINNATI

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES

Cut Costs...

by reducing TIME OUT for changing SET-UPS

Divide the setup time by the number of parts, and what do you have? If quantities are small, you have a major element in the cost of the part . . . an element which is particularly out of proportion when floor-to-floor time is very brief. In most cases, you can do something about this factor of cost through careful production planning *and* by equipping your shop with the latest machine tools. ¶ In precision toolroom grinding, CINCINNATI FILMATIC Hydraulic Universals offer several ways to reduce setup time to a minimum.

1. The hinged type internal grinding head, illustrated here, is placed in grinding position by merely swinging it down and tightening one bolt. *It's ready for action in a minute or less.*
2. Headstock spindle speeds are infinitely variable, instantly changed as desired by merely turning a handwheel.
3. The modified lathe standard headstock spindle nose greatly facilitates the mounting and truing up of chucks and face plates.

Many other features make CINCINNATI FILMATIC Hydraulic Universals the best buy for precision toolroom grinding. Catalog contains complete data. May we send you a copy?

CINCINNATI FILMATIC 18" Hydraulic Universal Grinder. Catalog G-486-2 contains specifications for the 12" Grinder, and catalog G-474-2 for the 14", 16" and 18" sizes; both available in lengths up to 72".

See the CINCINNATI GRINDERS DISPLAY at the MACHINE TOOL SHOW, Chicago, Sept. 17-26

INCORPORATED CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

ANY WAY YOU

VAN NORMAN

Ram Type Milling Machines

★ Are Easy to Operate
★ Cut Down Idle Time
★ Multiply Machine Output

From any point of view, management, production, or operator . . . Van Norman Ram Type Millers meet every milling requirement from accurate work to maximum production and economy.

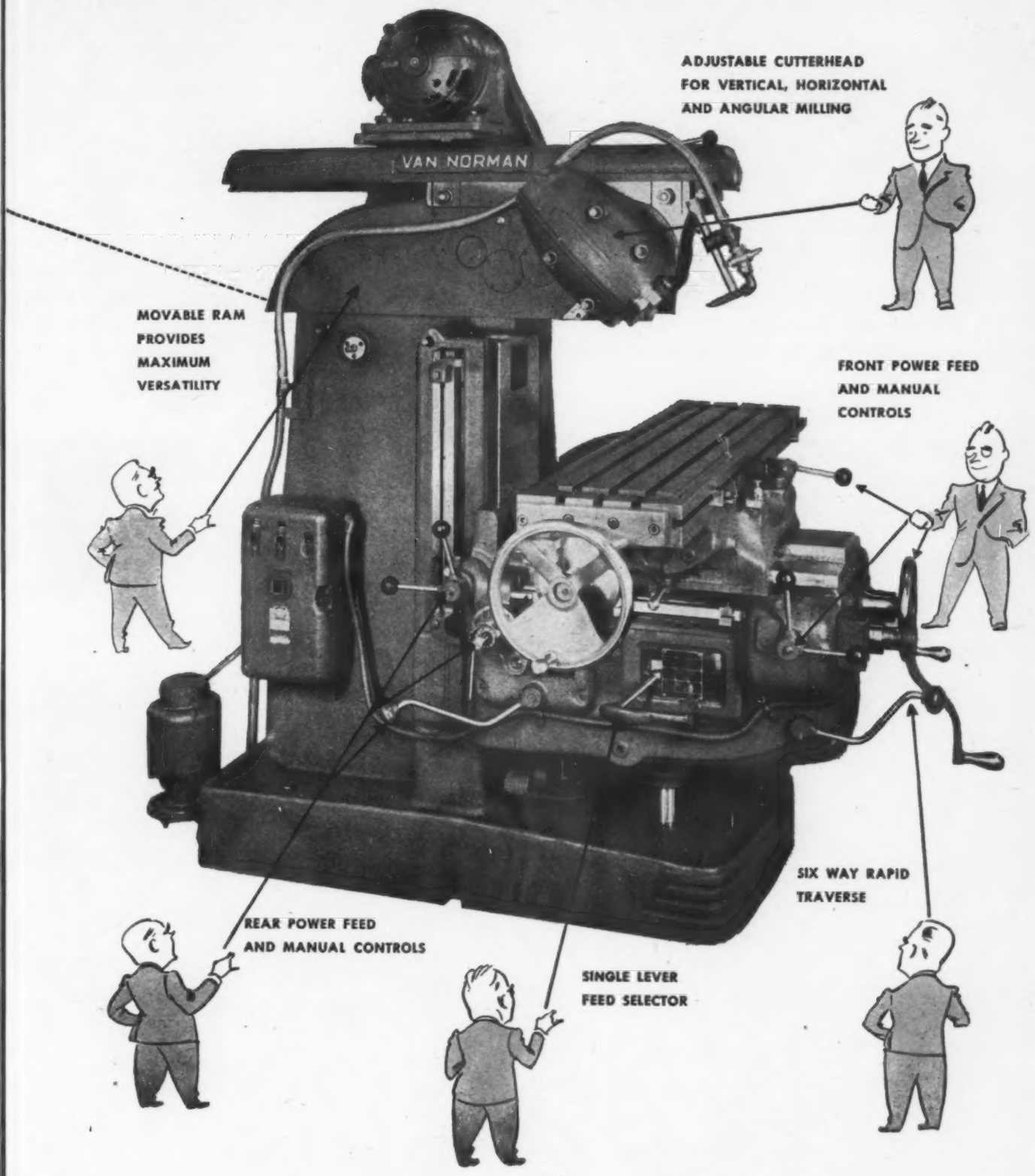
- *Adjustable Cutterhead* permits conventional horizontal and vertical as well as angular milling all on one machine . . . minimizes work setups . . . cuts idle machine time. In addition, this versatility enables you to meet job to job milling requirements.
- *Increased Range* — the adjustable cutterhead and movable ram provide maximum milling capacity and versatility.
- *Front and Rear Finger-tip Controls* of all power feeds, six way rapid traverse and hand adjustments provide extreme ease of control . . . reduce worker fatigue . . . increase output. Power controls operate in the desired table, saddle and knee movement assuring maximum simplicity of operation.
- *Single Lever Feed Selector* provides quick, easy selection of the proper feed for the type of work being milled. 18 feeds are instantly available from front or rear operating position.
- *Long Life Accuracy* is assured by precision Van Norman construction. Hardened alloy steel gears and multi-splined shafts operate on anti-friction bearings . . . automatic lubrication assures thorough oiling of all moving parts . . . massive knee, saddle and table assemblies provide rigidity.

Investigate Van Norman Ram Type Millers today. They are available in many models and sizes, with plain or universal saddles, to meet every requirement for toolroom, laboratory, machine shop, pattern shop, and general purpose milling.

VAN NORMAN COMPANY
Springfield 7, Massachusetts

"It pays to Van Normanize"

LOOK AT IT...


VAN NORMAN
ADJUSTABLE CUTTERHEAD FOR VERTICAL, HORIZONTAL AND ANGULAR MILLING
MOVABLE RAM PROVIDES MAXIMUM VERSATILITY
FRONT POWER FEED AND MANUAL CONTROLS
SIX WAY RAPID TRAVERSE
REAR POWER FEED AND MANUAL CONTROLS
SINGLE LEVER FEED SELECTOR

LANDEX DIE HEADS ... *designed for FINE ACCURACY on "live" spindle machines*

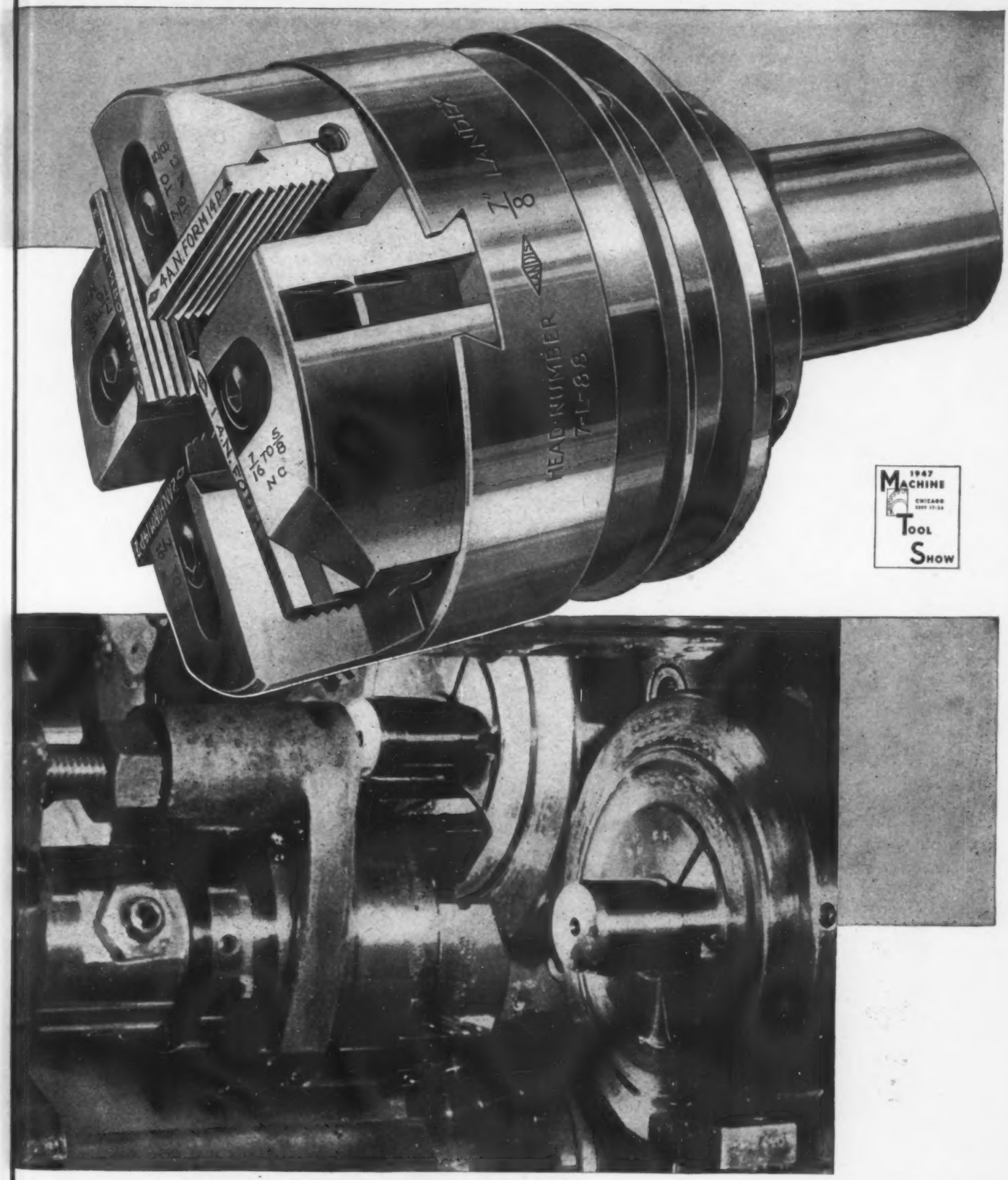
The Landex Hardened and Ground Die Head is designed for threading work where fine accuracy and maximum production are of prime importance. Developed for use on automatic screw machines, it is equally adaptable to drill presses and other machines having either a vertical or horizontal "live spindle."

The Landex Hardened and Ground Die Head is opened and closed automatically through a yoke attached to the machine. It has many distinctive features, such as: unusual flexibility in permitting quick set-up changes, wide range coverage, oversize capacity, low operating cost.

The Landex Hardened and Ground Die Heads employ the patented Landis Chaser which operates at a tangent to the work and which, for this reason, has the free cutting action and natural clearance of a lathe tool. This distinctive design results in long service between grinds and smooth finish and accuracy in the finished threads.

Write for Bulletin F-80

LANDIS



1947 MACHINE TOOL SHOW

MACHINE CO. WAYNESBORO PENNA. U.S.A.

Operator Output Up 37% Scrap Cut 25%

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.

A large electrical manufacturer who purchased three Landis Tool 10" x 20" Hydraulic Universal grinders for tool room work reported a 37% increase in output and 25% reduction in scrap over a previous machine.

in Tool Room Grinding

Here are some of the features of design that give such performance:

increased output

- Controls grouped for operator convenience.
- Rapid setup for various jobs with graduated swiveling headstock, wheelbase and swivel table, plus combination live and dead spindle headstock.
- Speeds adjustable for maximum output—adjustable speed headstock motor drive and adjustable speed hydraulic table traverse.

reduced scrap

- MICROSPHERE wheel spindle bearings permit closer work tolerances because exact bearing clearance is adjustable.
- Dynamic balance of rotating parts eliminates vibration of rotating parts and assures fine unmarred finishes.
- Hydraulic control permits more exact tolerances because you are free of jarring at reversal or end of cycle.

You may have an entirely different grinding problem. However, you will find the same features that make possible large output and close tolerances on the more than 200 types of grinders produced by Landis Tool.

Our engineers will be glad to assist you with your grinding problem. For more information on this machine request bulletin I 145. 65

optional features

Rotary Magnetic Chuck
Collett Chuck
Double End Wheel Mounting
Wheel Balancing Arbor

standard equipment

Combination Live & Dead Spindle Headstock
Face Plate for Live Spindle Grinding
Water Service
Two Work Rests
Removable Bracket Type Internal Fixture
6" 4 jaw Independent Chuck

LANDIS TOOL *Precision Grinders*

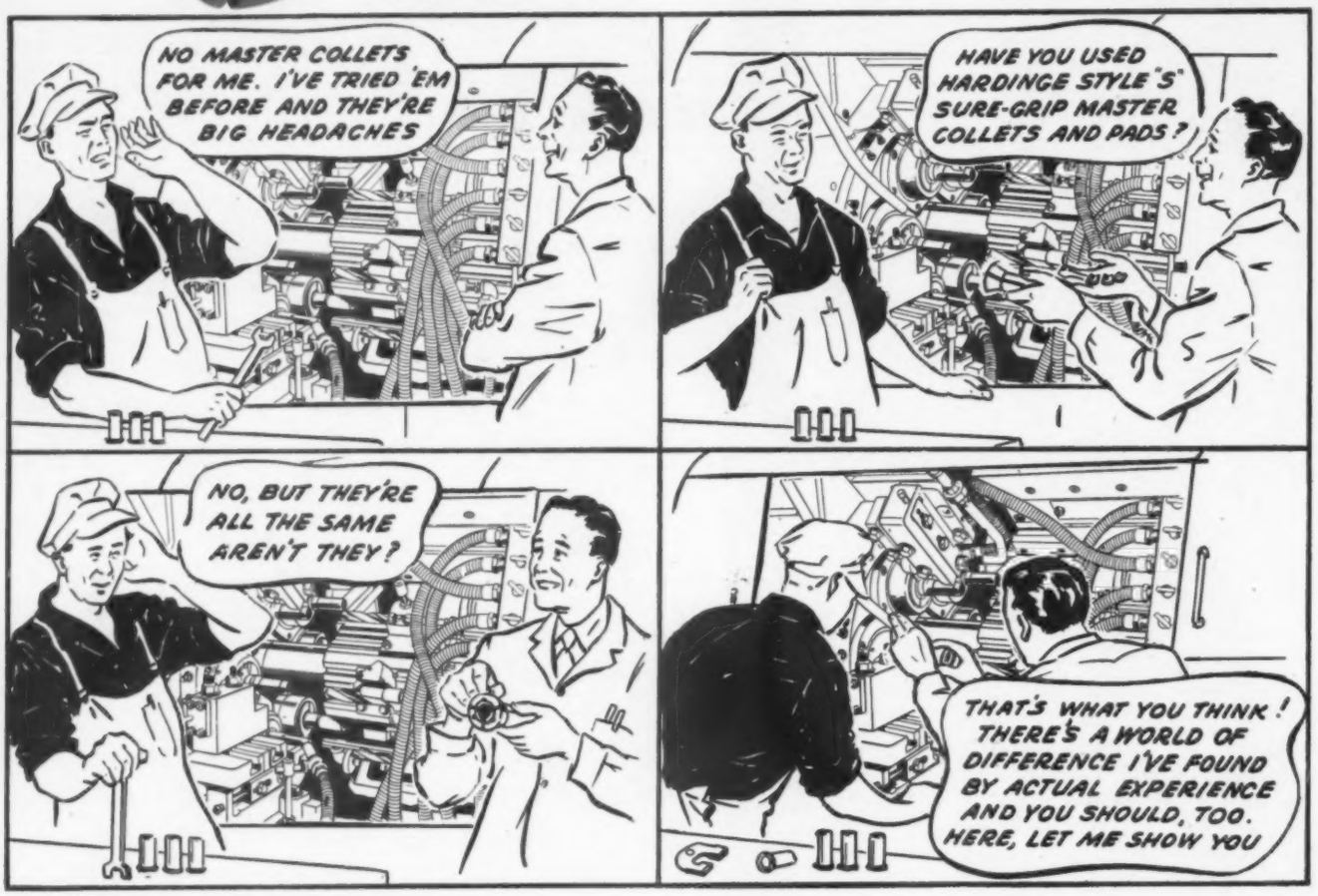
HARDINGE
ELMIRA, N.Y.

You can't know about

Master Collet Performance

until you use

HARDINGE Style "S" Collets


NO MASTER COLLETS FOR ME. I'VE TRIED 'EM BEFORE AND THEY'RE BIG HEADACHES
HAVE YOU USED HARDINGE STYLE "S" SURE-GRIP MASTER COLLETS AND PADS?
NO, BUT THEY'RE ALL THE SAME AREN'T THEY?
THAT'S WHAT YOU THINK! THERE'S A WORLD OF DIFFERENCE I'VE FOUND BY ACTUAL EXPERIENCE AND YOU SHOULD, TOO. HERE, LET ME SHOW YOU

Here is the BIG difference —

Hardinge Style "S" has an independent dovetail lock clamp that is secured to the pad only. Therefore, there is no strain between the pad and collet when loading stock or from thrust from end working tools. *All end thrust* is absorbed by the pad shoulders in the recess of the collet *as it should be* absorbed.

This unique feature does away with threaded holes. The collet angle and pad gripping surface are the same as a solid collet to give solid collet performance.

"Now I know why Hardinge Style "S" Sure-Grip Master Collets and Pads will overcome the objectionable working loose of pads. Now I can benefit by low pad prices, plus the advantage of changing pads without removing the master collets from the automatics."

Ask for our free bulletin "S" and specify Sure-Grip Master Collets and Pads.

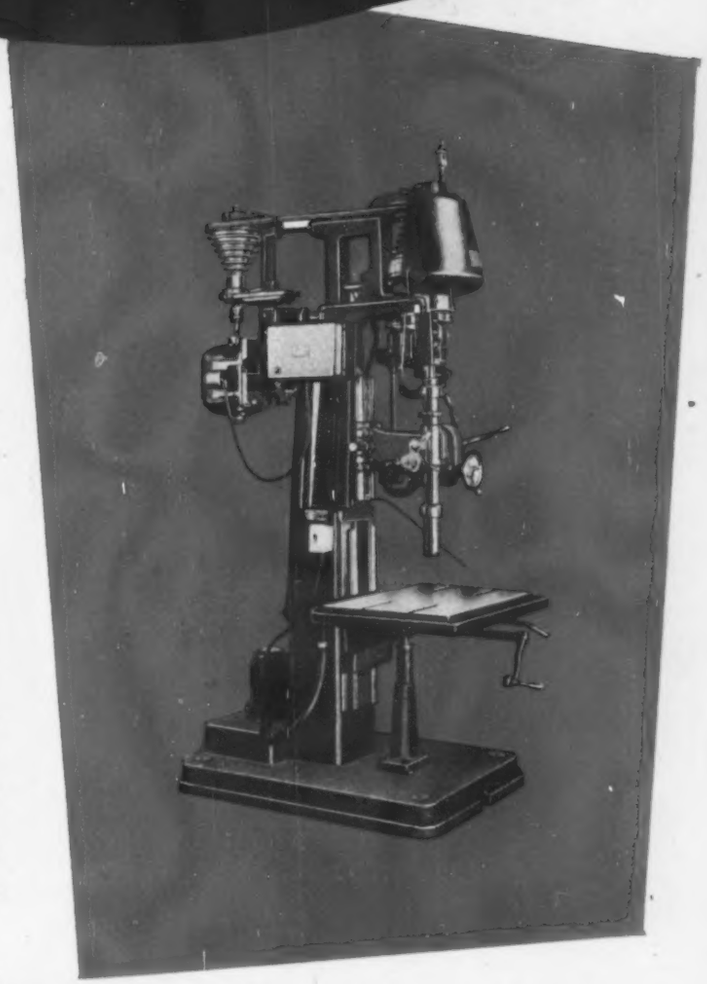
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

C-O Steals the Show!

21" BOX COLUMN SLIDING HEAD FLOOR DRILL

Designed to provide an accurate, fast, dependable drill for a moderate initial investment and low maintenance cost. Unit is equipped with anti-friction ball bearings; all castings are seasoned and sturdy; all gears of high alloy steel, accurately machined; all surfaces are hand scraped to a minimum tolerance. Available with V-belt drive — 16 spindle speeds. Power feed of positive, gear driven type. Four rates of speed are obtained through dial knob indicator. Automatic stop for predetermined depth drilling. 1-½" capacity.



Since 1892, CANEDY-OTTO on a drill press has stood as a guarantee of advanced designing, quality construction, finer performance, long, trouble-free service. Write today for insert No. 90 illustrating the World's Most Complete Drill Press Line.

C THE WORLD OVER O

CANEDY-OTTO MFG. COMPANY

CHICAGO HEIGHTS, ILLINOIS

Builders of the World's Most Complete Drill Press Line — radial drills, sensitive drills, upright drills, hi-speed drills and special drilling machinery.

MORSE
Spring Tempered Shank has high tensile strength to absorb torsional stress and shock.
Super High Speed Steel Head is butt-welded on shank, for greatest cutting action.
Note Expansion Feature which allows compensation for wear—giving long life to cutting head. Hollow head adjusting screw is countersunk to permit grinding upon centers.
No. 1734
TAPER SHANK
No. 1733
STRAIGHT SHANK

Like Tabby...

MORSE *Expanding Chucking* REAMERS

have more than One Life

...and Longer Life per grind when reground

You're looking at a reamer that can really take on a volume of work! Due to its *expansion* feature, it can be reground and reground each time it's worn slightly below size. The cutting head is Super High Speed Steel —butt-welded onto a spring tempered shank. Result: An expanding chucking reamer designed for rugged duty, long life and maximum cutting efficiency.

Morse makes a full line of reamers that will do every reaming job to your tolerances. Over 80 years of Morse engineering know-how pays off, too, in drills, cutters, taps, dies and special tools that step up volume and lower your costs. Your Industrial Supply Distributor can obtain the Morse recommendation that fits the tool to *your* job.

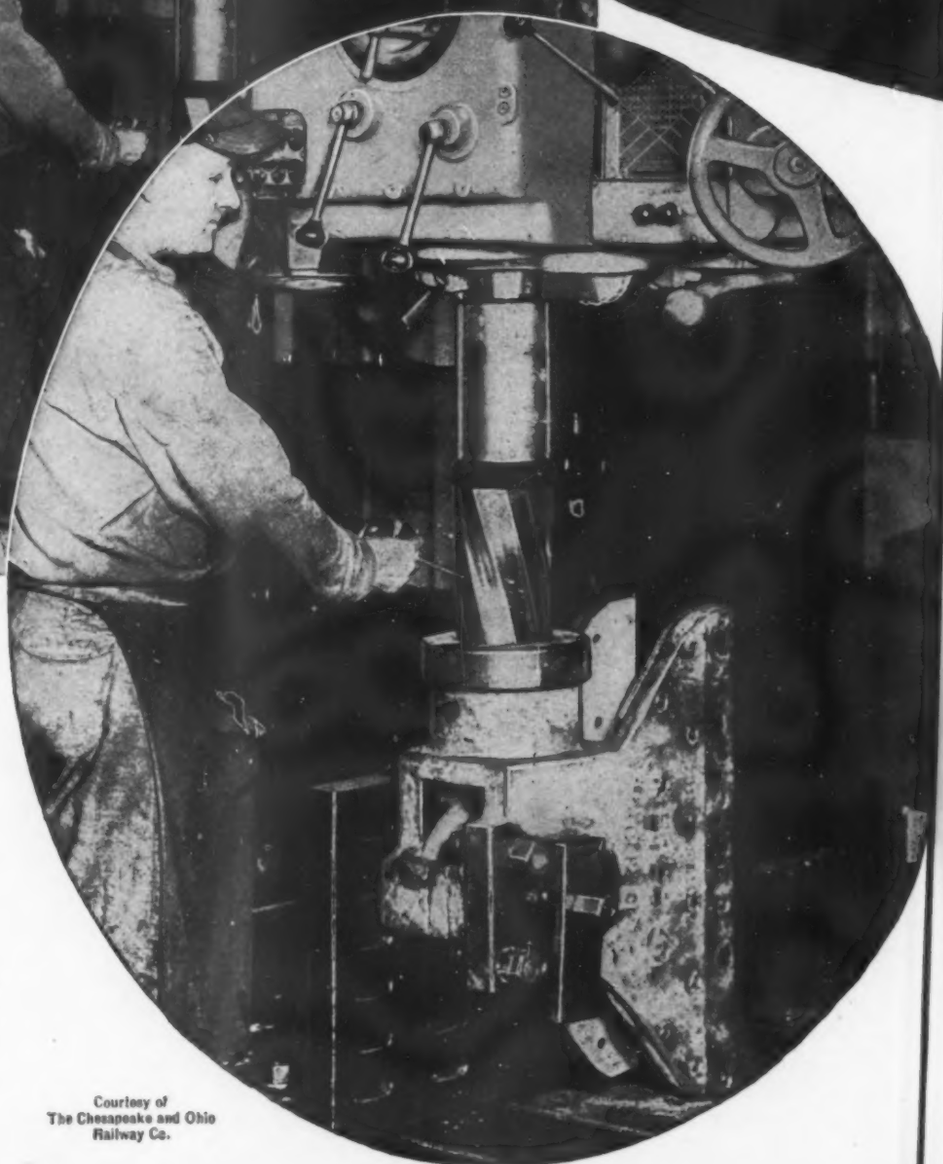
Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.



Taper reaming locomotive cross heads for piston rod fits.

Courtesy of
The Chesapeake and Ohio
Railway Co.

THE AMERICAN TOOL WORKS C

The Acid Test of SPINDLE CONSTRUCTION

Reaming cross heads for piston rod fits is about the toughest job you can find for a radial drill spindle.

This work must be done at slow speeds, without chatter and with a fine finish.

IT'S A TOUGH ONE BUT—

1 **The boring mill construction of the "American" Hole Wizard Spindle does the job. Its 100% anti-friction design with adjustment for wear insures frictionless operation and maintenance of original accuracy.**

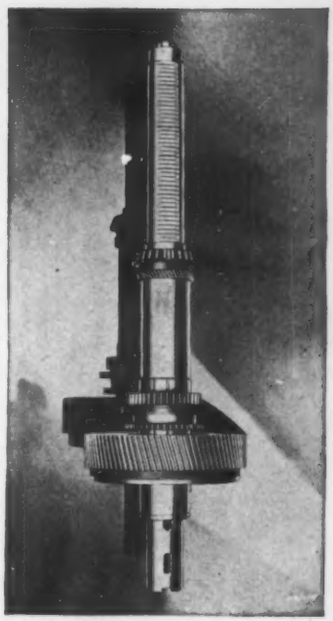
2 **The patented Double Lo-Hung Spindle Drive locates the large diameter driving gear at the bottom of the head close to the work, thus minimizing spindle torque.**

3 **The large diameter spindle, recently increased to add 37% to its rigidity, easily resists the enormous torsional effort imposed by this job.**

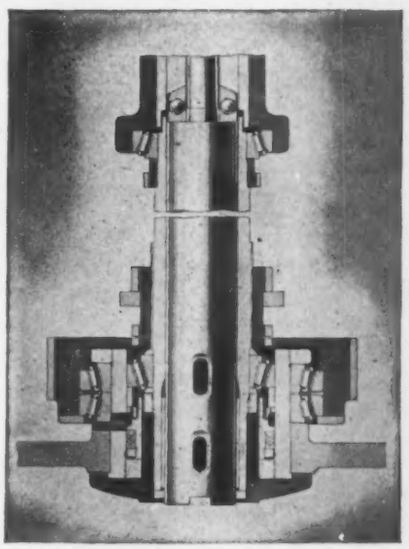
4 **Spindle shake is reduced to an absolute minimum by allowing only .00025" freedom between the ground nitrided spindle and the honed nitrided spindle sleeve. This is especially valuable on accurate boring operations.**

These four spindle characteristics are YOUR assurance that YOUR tough ones will be done easier, quicker and cheaper with an "American" Hole Wizard on the job.

Civilian goods and services must be produced in greater quantities and at lower costs. The "American" Hole Wizard Radial definitely is a contributor to this cause.



Patented Double Lo-Hung Spindle Drive.

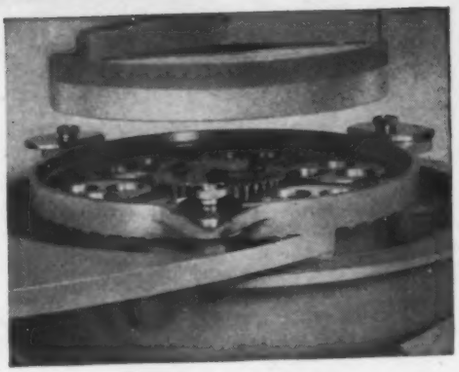


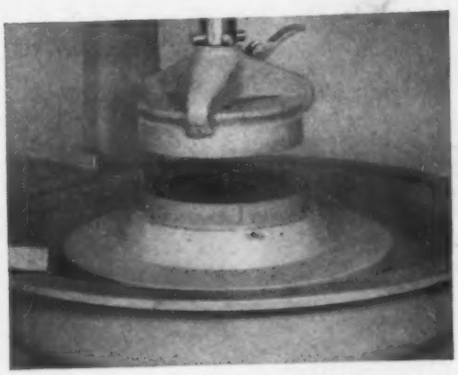
Patented Double Lo-Hung anti-friction spindle mounting.

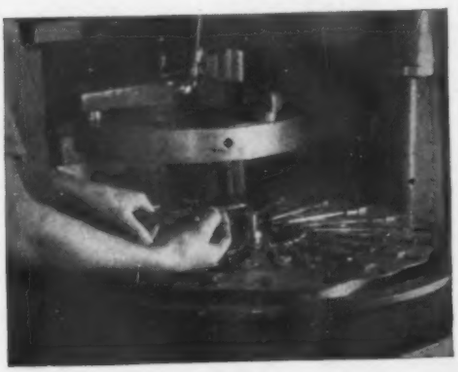
BULLETIN 327 TELLS THE STORY . . . YOURS FOR THE ASKING

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Are You Precision Lapping?





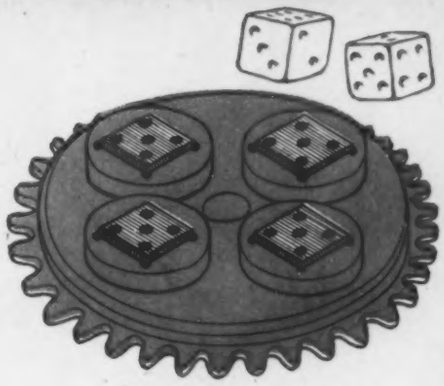


The NORTON 301 Flat and Cylindrical Lapping Machine is suitable for many purposes in the tool room and on the production line. This machine is well proportioned and uses a principle of moving the work in an ever changing pattern between two circular laps. Investigate the possibilities of this machine for lapping parts in your production. Write for bulletin 1482.

NORTON COMPANY, WORCESTER 6, MASS.

The NORTON 10-U
SPEEDY and VERSATILE

Non-metallic products such as ceramics and plastics offer an important field for lapping. For example, celluloid cubes are lapped to amazingly close accuracies using two-piece sprocket type workholder with adapters as shown and moving the work between bonded abrasive laps.



For small parts, such as might be used in the watch industry, the 10U Lapper is arranged with 8" diameter laps instead of the conventional 14 or 16" size. Here again parts are often lapped to sizes within .000025" for accuracy. For this particular part, a watch plug gage, a plate-type workholder is used with cast iron laps.

The success of the Diesel engine is due in great measure to the efficiency of the fuel injector unit. Plungers, bushings and needles are lapped to amazing accuracies to insure proper operation when "under fire". Cast iron laps are used and the work is carried in workholders made to order for the particular parts involved.

NORTON GRINDERS
and Lappers

DESIGNED FOR HIGHEST OUTPUT . .

THE NEW

P. & J. Automatics will be Demonstrated in Action
BOOTH 213
MACHINE TOOL SHOW
Chicago — Sept. 17-26

Left: The new 3U Automatic Turret Lathe, shown in comparison with the 9D, the largest P & J Automatic Chucking and Turning Machine.

Right: Head end view of the 3U illustrates its compact design and rugged construction.

POTTER & JOHNSTON MACHINE

. . . LOWEST PRODUCTION COSTS

3U SPEED-FLEX AUTOMATIC TURRET LATHE

Hit new highs in output, new lows in production costs per operator with the new 3U SPEED-FLEX Automatic Turret Lathe. Designed especially for machining casings and forgings up to 6" diameter the new 3U SPEED-FLEX has a standard spindle speed range of 73-1445 R.P.M., plus ample power and rigidity that enables full use to be made of tungsten carbide tools. Four automatic changes of speed are accomplished with each set of hand pick-off gears. Similar sets of gears, easily changed, provide groups of three automatic changes of feed. All speed and feed changes are effected by electro-pneumatic control of multiple disc clutches, which are engaged and disengaged by means of solenoid valves. Very close settings of the dogs attached to the control drums are possible, resulting in split-second changes, and reducing non-cutting time to a minimum. Turret slide can drop from rapid traverse to feed for ¼" and back to rapid traverse in two seconds, using top speed and .010" feed. Rapid traverse movement of turret slides and cross slides for the complete cycle of the machine is only 24 seconds. Turret slide and cross slide feed ranges are from .0023" to .0684" or from .0042" to .125" per spindle revolution.

3U SPEED-FLEX—the latest, the fastest Automatic in the complete P&J line—opens up greater possibilities for obtaining profitable high output and reducing labor costs in the machining of a new size range of parts. Send us your prints or parts, and we will suggest tooling and quote actual production times of the 3U SPEED-FLEX set up to perform your jobs—better, faster, more economically.

OUTSTANDING FEATURES FOR GREATER EFFICIENCY

Modern, rigid construction throughout bed, turret and cross slides, with box type of base.

All high speed shafts and spindle mounted on anti-friction bearings.

Hardened and ground steel ways for turret slide mounted in base. Hardened and ground steel inserts in turret slide.

All gearing of chrome vanadium steel, heat treated and shaved.

Full electric controls. Automatic stop at completion of work cycle. Complete safety features for protection of machine and operator.

Turret automatically clamped in position after indexing. Combination locking and binding wedge assures accurate alignment with spindle.

Bijur lubrication of turret slide and bed ways. Cascade oiling of all bearings and gearing in aluminum gear box.

Standard spindle speed range: 73—1445 R.P.M. Optional dual range: 36—711 and 73—1445 R.P.M.

Swing over cross slide: 8¾". Cross slide travel each way: 2½". Turret slide travel: 6".

Operating air cylinders made of copper ferrite honed to .0002". Piston of hardened steel, Parker Luberized to prevent rusting from water in air line.

COMPANY · PAWTUCKET, R. I.

KAISER ALUMINUM

HOW PERMANENTE METALS—IN A SINGLE YEAR—HAS BECOME A KEY FACTOR IN AMERICAN INDUSTRY—PRODUCING 175 MILLION POUNDS OF KAISER ALUMINUM!

One year ago, for the second time in over half a century, a new force stirred the aluminum industry.

After careful planning and organization, The Permanente Metals Corporation—led by Henry J. Kaiser and associates—started to carve out a permanent place in the aluminum world.

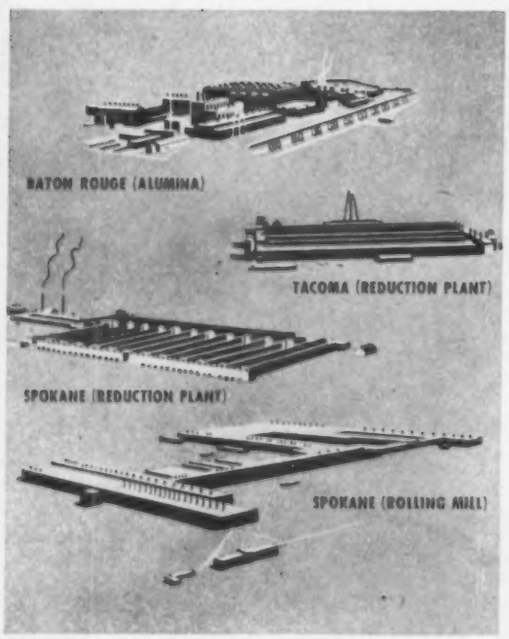
The first objective: To produce aluminum in tremendous volume and thus offset the shortage which was then crippling the production of finished products.

That this objective was achieved . . . and surpassed . . . is revealed by one statistic—175 million pounds of plate, sheet, and strip aluminum in the first year. Almost as much as the entire industry produced in the most productive year before the war!

The pictures and text on these pages *partially* reveal how this was done.

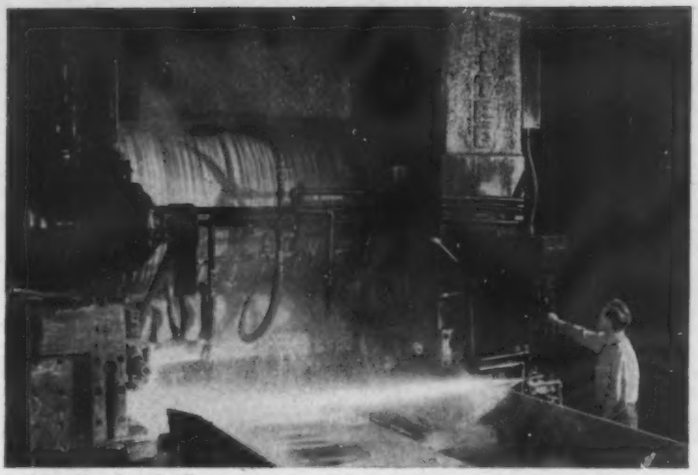
What they cannot hope to portray is how administrative vision, technical skill, and a completely coordinated operation combined to make such production possible.

This same combination is now achieving Permanente Metals' second objective—to make Kaiser Aluminum, already second to none, the finest in the land!

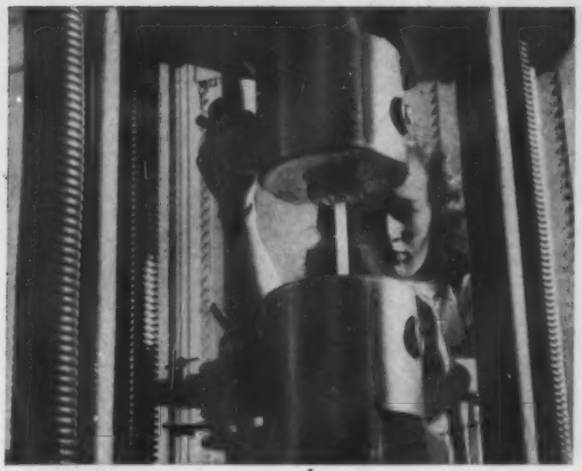


1. From bauxite processing to finished product—This chart gives a step-by-step picture of Permanente Metals' aluminum operation . . . which controls the production of quality aluminum from its huge bauxite processing plant at Baton Rouge, Louisiana . . . through its mammoth reduction and finishing plants at Spokane and Tacoma, Washington. Such integration assures fast, reliable service.

2. Preparing the "pig"—Operating eight modern pot lines, Permanente's reduction plants at Spokane and Tacoma, Washington, can turn out over 700,000 pounds of pure pig aluminum daily. This pig aluminum is then sent to the rolling mill, also in Spokane, where it is converted into alloyed ingots and then rolled into plate, sheet and strip.



3. Down the "hot line"—Permanente Metals' 53-acre Spokane rolling mill is one of the largest, most modern plants of its kind in the world. An example of its up-to-the-minute equipment is the "hot line," the giant rolls which convert alloyed aluminum ingots into sheet. This rolling mill is capable of producing 288 million pounds of Kaiser Aluminum a year.



4. Quality first—With production reaching new peaks, Permanente Metals is now concentrating on producing the highest quality aluminum ever offered to manufacturers. Constant chemical and physical tests plus infinite care in handling assure that customer requirements are not only met, but exceeded.

5. Ready to go—Here is the result of just one day's rolling mill production of Kaiser Aluminum. Ready to ship, it will go into aircraft, buses, building materials, house trailers, appliances, garage doors, kitchen utensils . . . will be welcomed by scores of America's leading manufacturers who rely on Permanente Metals for quality aluminum, fast, dependable deliveries, and an eagerness to be of service!

Ready to serve you—*today*...

Kaiser Aluminum

a Permanente Metals product

DISTRIBUTED BY PERMANENTE PRODUCTS COMPANY, KAISER BLDG., OAKLAND, CALIFORNIA...WITH OFFICES IN:
Seattle, Wash. · Oakland, Calif. · Los Angeles, Calif. · Dallas, Texas · Wichita, Kan. · Kansas City, Mo. · St. Louis, Mo. · Atlanta, Ga. · Minneapolis, Minn. · Milwaukee, Wis. Chicago, Ill. · Cincinnati, Ohio · Cleveland, Ohio · Detroit, Mich. · Boston, Mass. · Hartford, Conn. · Buffalo, N.Y. · New York City, N.Y. · Philadelphia, Pa. · Washington, D.C.

Plans for top production and lower costs 1947-'48
THE AIR-HARDENING MATCHED SET
THE OIL-HARDENING MATCHED SET
THE WATER-HARDENING MATCHED SET
THE RED-HARD MATCHED SET
No. 610 AIR-WEAR
HAMPDEN OIL-WEAR
K-W WATER-WEAR
STAR-ZENITH RED-WEAR
No. 484 AIR-HARD
STENTOR OIL-HARD
11 SPECIAL WATER-HARD
T-K RED-HARD
VEGA AIR-TOUGH
R.D.S. OIL-TOUGH
SOLAR WATER-TOUGH
No. 883 RED-TOUGH
GREATER WEAR RESISTANCE
GREATER TOUGHNESS
GREATER HARDENING ACCURACY AND SAFETY
GREATER HARDENING ACCURACY AND SAFETY
RED HARDNESS
N
W
E
S
Carpenter
MATCHED
TOOL STEELS

It's here!

A NEW *Carpenter* MATCHED SET

THAT *Simplifies* YOUR TOOLING AND PRODUCTION *5* WAYS!

Simplifies {
- Your Selection Of The Right Tool Steel!
- Your Tool Steel Inventory Problems!
- Your Job Of Boosting Output!
- Your Problem Of Lowering Unit Costs!
- Your Heat Treating Procedures!

Here is a method that can simplify your tooling and production all along the line from tool making to finished output!

Since its development in 1934, the Carpenter Matched Set Method has been used as a simplified guide to the selection of the right tool steel for best results.

Now, this new Matched Set of Carpenter Tool Steels gives you even greater possibilities of getting top tool performance. Your problem of selecting the right steel for each job is greatly simplified. Just by following the arrows—"north" for greater wear resistance, "south" for greater toughness, etc.—you will actually know in advance what results to expect. Moreover, with far fewer steels to work with, you can simplify your heat treating procedures, lower inventory investment—and reduce chances of tool steel "mix-ups."

Start now to take the "guesswork" out of your tool room—use this sure, safe guide to better, longer-lasting tools. The new 189-page Carpenter Matched Tool Steel Manual gives you all the information you need—including a handy 80-page Selector Section and complete, easy-to-use heat treating data. Your Carpenter representative is the man to see for your copy. Call or write him, today.

AND YOU CAN GET IMMEDIATE DELIVERY FROM STOCK!

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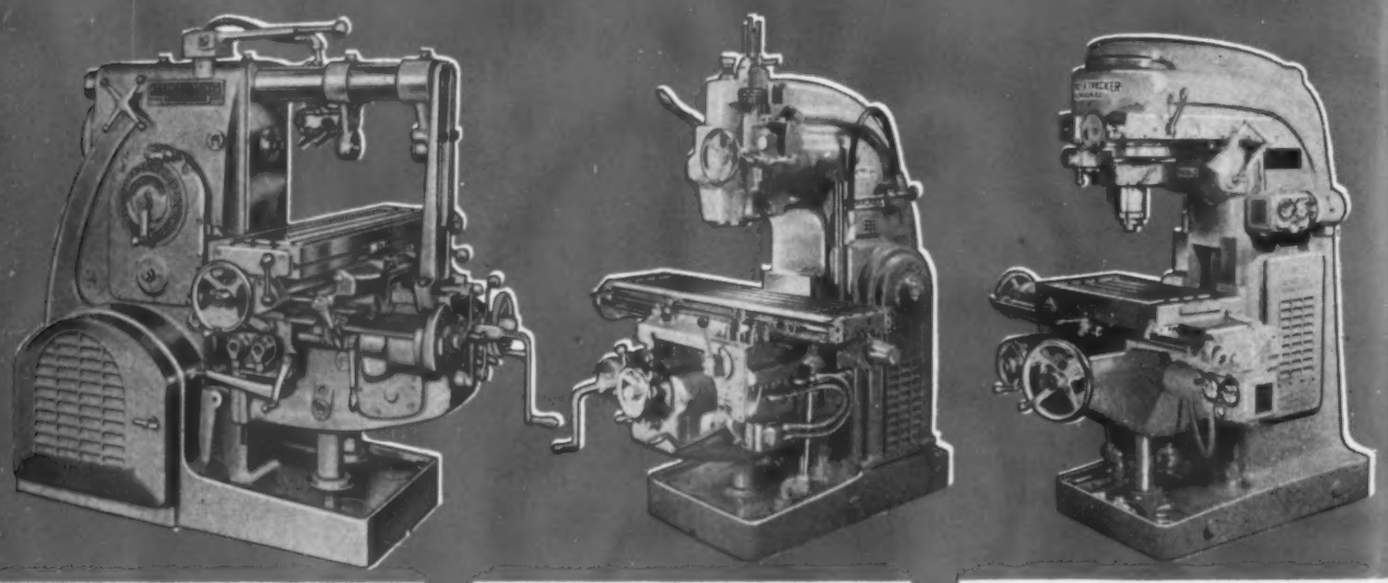
THE CARPENTER STEEL COMPANY • 109 BERN STREET • READING, PA.

MACHINE TOOL

Kearney & Trecker presents tomorrow's wait one, two or three months for

1 MILLING MACHINES AT THEIR BEST— DESIGNED TO PUSH COST CURVES DOWN!



CSM Milling Machines— Super-powered — Set new high metal removal records!

Here's the machine that really *uses Carbide cutters to top efficiency.* This means a big boost in your production. You can get either Plain or Vertical Types in two working ranges with either 20, 30 or 50 horsepower.

Write for bulletin No. CSM-20.

Automatic Cycle Models —Combine hi-production use with Knee-type versatility!

Yes! You get automatic operation for long-run lots . . . new, simpler and easier control for short-runs. Your choice of 34 different Knee-Type Automatics, Plain or Vertical models in 14 different sizes and horsepower.

Write for bulletin No. AC10.

Rotary Head Milling Machine — Revolutionary! Produces any geometric shape!

The most versatile milling machine you ever saw! Works on entirely new principles. Mills any geometric form *without* models, templets or tracing devices. Can practically *guarantee 35% savings* on most tools, dies, molds.

Write for bulletin No. 1002C.

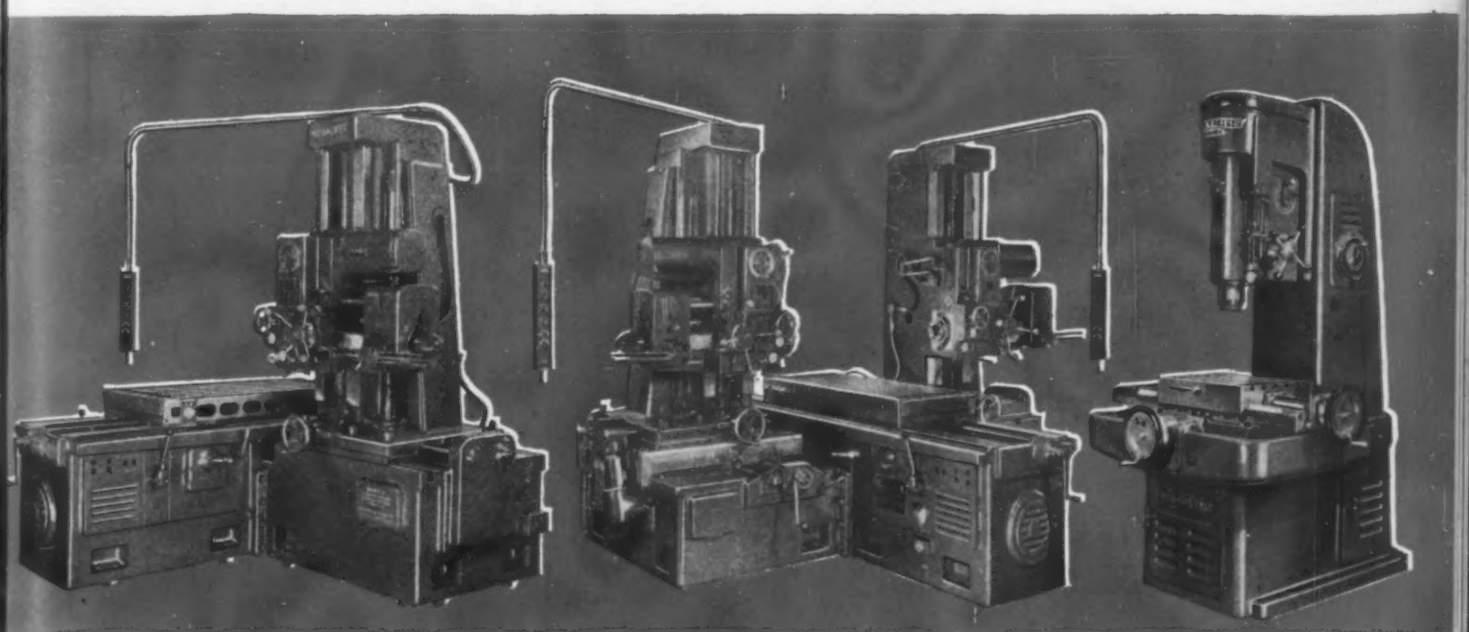
See these and other great new Kearney & Trecker machine tools at the Machine Tool Show Sept. 17-26

KEARNEY & TRECKER CORPORATION

PRE-VIEW . . .

machines today . . . and you don't have to them . . . They're available right now!

2 BORING MACHINES AT THEIR BEST— DESIGNED TO PUSH PRECISION CURVES UP!



Models No. 3T and No. 3TT Precision Milling and Boring Machines — Specifically built to meet exacting requirements of ultra-close tolerance milling and boring on production, tool, jig or fixture work.

You can put the most exacting of "plus-or-minus tolerance" milling or boring jobs on either of these machines and be *perfectly confident* of top results. For single-spindle applications, the Model T machine provides wide working range. The Model No. 3TT can be used for performing precision milling and boring operations simultaneously on single workpiece without resetting. Both machines are ideally suited to precision and production boring and milling. Yes — for "fussy" development or tool room jobs you'll get the kind of precision you're looking for.

Write for bulletin No. T11A.

Model C Autometric — America's top machine for Precision Boring.

You get the benefit of nearly a half century of research in precision boring and the most exacting machine standards ever set at Kearney & Trecker. The Model C Autometric will produce incredibly accurate results for you.

Write for bulletin No. CMA-10A.

TRECKER

MILWAUKEE 14, WISCONSIN

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Goodyear Tire & Rubber Co. are making a 30-foot rubber electric heating pad to dry the inks used in printing textile fabrics.

get ready with CONE for tomorrow

Farnsworth Television & Radio Corporation has the "Utiliscope", a television set that shows, in any room, a continuous picture of operations in a remote, inaccessible or dangerous part of a plant.

be ready with CONE for today

The Moore School of Engineering of U of P is building an electronic computor. It is reported that this new machine is faster than the famous ENIAC, will remember fifty times as many numbers and uses only 3,000 tubes, instead of 18,000.

get ready with CONE for tomorrow

The new Blaw-Knox equipment pulverizes coal by self-abrasion in a blast of super-heated steam.

be ready with CONE for today

The Marmon-Herrington 44-passenger trolley bus uses light metals to reduce weight to 17,230 pounds.

get ready with CONE for tomorrow

General Electric Company has two steam turbine generators under construction for electric power companies. These will use steam at 2,000 pounds pressure and 1,050 degrees and develop 125,000 kilowatts.

be ready with CONE for today

Western Pine Association hopes to cut lumber drying time to 4 hours by the use of acetone spray.

get ready with CONE for tomorrow

Flaw-free 90° creases can now be formed in thermoplastic sheet of .005" to .020" thickness up to 30" wide on a repetitively uniform, high-speed production basis with a newly designed machine incorporating thermostatically controlled "instant-crease" action developed by the Sheet Plastics Equipment Division of Taber Instrument Corporation.

Dow Latex 512 is offered as an immediately available substitute for linseed and other vegetable oils.

get ready with CONE for tomorrow

In a new method of bridge building, developed at the University of Illinois, the concrete roadway is rigidly connected to the steel structure. This "composite construction" is said to save 30% in the weight of steel beams used.

be ready with CONE for today

Shell Chemical Co. has plans for the commercial production of glycerin from petroleum in 1948.

get ready with CONE for tomorrow

National Carbon Co. claims that its new flashlight cell has double the capacity of previous cells due to improved chemical mixture.

Commonwealth Edison Co. has a "cyclone" burner in its Calumet Station that removes 80% of the coal ash as molten slag in the burner.

be ready with CONE for today

Improvements and innovations in multiple spindle automatic bar machine design will be represented by the new models on display at the Cone Automatic Machine Co. booth at the Chicago Machine Tool Show.

get ready with CONE for tomorrow

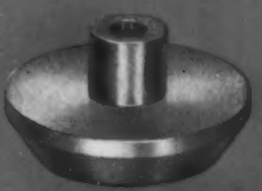
Link-Belt Company's Electro-fluid Drive is a combination of electric motor and the familiar "fluid flywheel". It reduces the starting load, cushions shocks and prevents damage from overload.

be ready with CONE for today

Experimental work on a process for forming cold bonderized sheet steel under pressures as high as 230,000 psi is being conducted by Heintz Manufacturing Co. of Philadelphia. If successful, the process may greatly reduce the cost of many common steel articles.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

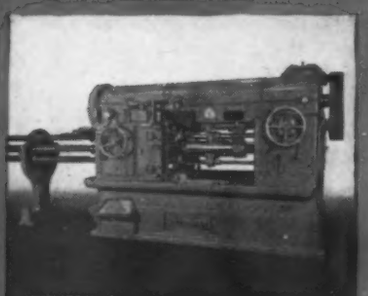
Put the *usual* jobs on any automatic.



Put the *particular* jobs on a CONE.

From 1⅞" dia. SAE 1112 a 6-Spindle Conomatic produces the part shown in 44 seconds.

See the CONE *booth at the Machine Tool Show.*



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

41

FORMED CUTTERS BY *Union*

You can produce odd-shaped parts accurately and at profitable high speeds with the Union Formed Cutters. Cutters to fit any machine . . . to cut any practical shape . . . in any metal . . . can be made either from samples of your work from your old tools, or from drawings. Your exact dimensions, specifications and tolerances will be followed faithfully, even when you request accuracy beyond normal commercial limits. Use Union Formed Cutters—and all the tools in the complete Union line—to bring every metal cutting job up to a uniform high standard.

UNION TWIST DRILL COMPANY
ATHOL, MASS.

Butterfield Division, Derby Line, Vermont
Butterfield Division, Rock Island, Quebec
S. W. Card Mfg. Co. Division, Mansfield, Mass.

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San Francisco: 121 Second St.
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CARD

QUALITY plus SERVICE

Get Card quality on all your tapping jobs by taking advantage of Card complete service. Send details of your troublesome jobs, and we'll advise you on all the many factors that influence good thread production — preliminary drilling and reaming, thread depth, feed and speed, type of coolant, and — of course — the best Card Tap to do the job.

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524 East Fourth Street

SEATTLE:
568 First Avenue, South

S. W. CARD MFG. CO.
MANSFIELD, MASS.
Division of the
Union Twist Drill Co.

REAMERS BY *Butterfield*

A COMPLETE LINE

Why Butterfields? Because you can choose with confidence the one right tool for every job from this single, convenient source of supply . . . Because Butterfield's specialized skill and experience in reamer design and manufacture gives you tools that can be depended upon—always—to give superior performance, greater tool economy and uniform accuracy. For every reaming job . . . choose from a complete Butterfield line.

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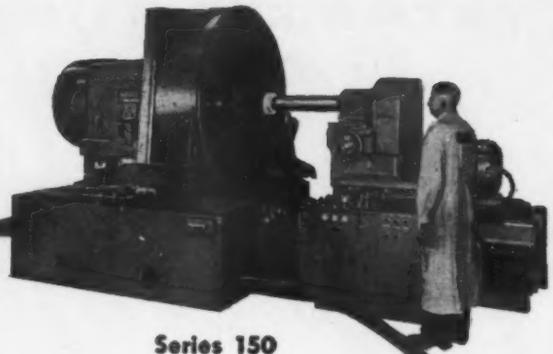
DIVISION OF THE
UNION TWIST DRILL CO.

A fine line

of Internal Grinders for every tool room and production requirement



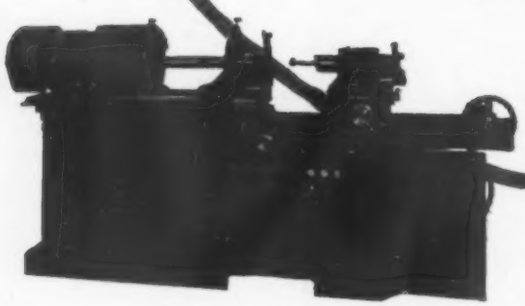
Series 150

Series 107

Series 112

BRYANT has designed and built precision internal grinders for 38 years. Today, their completely modern line covers the grinding of holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the cam attachment. The Series 150 has a face plate 60" in diameter and will swing work up to 50". A special machine will take 100" swing. The Series 107 is equipped with Bryant High Frequency wheelheads giving speeds up to 100,000 R.P.M. for extremely small bores. Maximum swing of the 107 is 9". Series 112 machines are for general purpose tool room work. They incorporate many quick-changeover features and will swing 16". The 112-M machines are similar to the 112, but have provision for grinding long bores such as machine tool spindles. Series 212 grinders are completely automatic and will grind bores from 5/16" to 6" in diameter. The High Frequency head is used on the 212 for maximum efficiency on small bores. All these machines incorporate the exclusive Bryant feature of hardened and ground cylindrical slide construction and three-point bearing. Complete specifications are available on all Bryant precision internal grinders — write today.

BRYANT Postwar Development



Series 112 M

Series 212

Send for the Man from

BRYANT CHUCKING GRINDER CO.

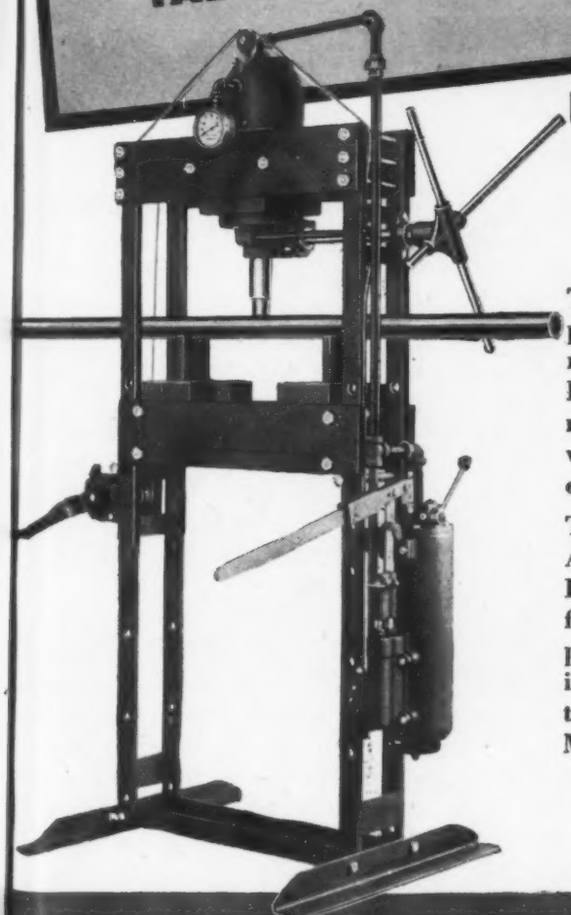
SPRINGFIELD, VERMONT, U. S. A.

BRYANT

Save time ON PRESSING, BENDING, STRAIGHTENING WITH A

KRW HYDRAULIC ARBOR PRESS

INDISPENSABLE IN ANY SHOP ...HANDLES SHORT-RUN PRODUCTION WITH LOW-COST DIES ...AVAILABLE IN 25 TO 75-TON CAPACITIES, EITHER HAND-OPERATED OR MOTOR-DRIVEN, WITH VERTICAL OR HORIZONTAL RAM TRAVEL.



KRW HAND-OPERATED PRESSES

The old conception of an arbor press is as different from the modern KRW Hydraulic Arbor Press as day is from night . . . now they are built in innumerable shapes, sizes and adaptations to work on hundreds of production jobs other than common straightening, bending and pressing work.

They are available as speedy Hand-Operated Presses; highly flexible Air-Operated Presses or as versatile and effortless Motor-Operated Presses. Then too, they are built in almost any conceivable physical form . . . tall, short, narrow, vertical or horizontal standing, as gap presses, forming brakes and many other designs. Mass production in a modern plant keeps KRW prices at rock bottom and quality at the highest possible peak. Write for the KRW illustrated Press Catalog. Mail the coupon for your copy now.

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USA

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Please send me information regarding 11

KRW Hand-operated Presses ☐
KRW Air-oil Operated Presses ☐
KRW Motor-Driven Presses ☐

Name_____

Address_____

City and Zone_____ State_____

EVERYTHING WITHIN EASY REACH.

CONTROLS of the No. 5 Plain Grinding Machine are so accessible that maximum efficiency of operation can be maintained with minimum effort. The table tray is a handy place for work pieces, dogs, and tools. Recessed base provides ample leg-room when operators are seated.

CONVENIENT HEIGHT of this machine is another feature that encourages top efficiency when operators are standing at their work. This advantage is illustrated at the left where grinding main bearing surfaces on small crankshafts is a quick, easy job.

CONVENIENT OPTIONAL EQUIPMENT may be ordered with the No. 5 Machine—Independent Automatic Cross Feed (for straight-in-feed grinding); Wheel Spindle Reciprocating Arrangement (for better finish at a faster rate with less wheel truing on plunge-cut grinding); and Wheel Slide Rapid Travel (for easy insertion and removal of work).

BROWN &

FOR NEW PRODUCTION RECORDS ON CLOSE-TOLERENCE CYLINDRICAL GRINDING JOBS

The No. 5 is a small machine developed particularly for rapid grinding of small parts on a production basis. It is also economical for grinding small parts in toolrooms having sufficient work to warrant a plain grinding machine. Here's why . . .

Accurate sizing to .0001″ on work diameter.

Close-fitting spindle cuts spark-out time to a minimum.

Automatic starting and stopping of headstock and coolant pump controlled by cross feed handwheel . . . simplifies and speeds operations.

Automatic lubrication to lessen wear and reduce maintenance.

The No. 5 Plain Grinding Machine is made in two sizes . . . 3″ x 12″ and 3″ x 18″. For greatest efficiency on high production, work speeds and table speeds are designed for diameters up to about 1″. Get complete details on this machine that *saves time for production* and takes *less time for setting up*. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Visit our Booth No. 505 at the Machine Tool Show

SHARPE B·S

75 H.P. AUTOMATIC LATHE CUTS TURNING TIME FROM 23.7 TO 3.82 MINUTES

Operation view of 75 horse power Sundstrand Model 16 Automatic Lathe turning one end of a steering clutch shaft.

Tough Steel Shafts Turned with Multiple Carbide Tooling

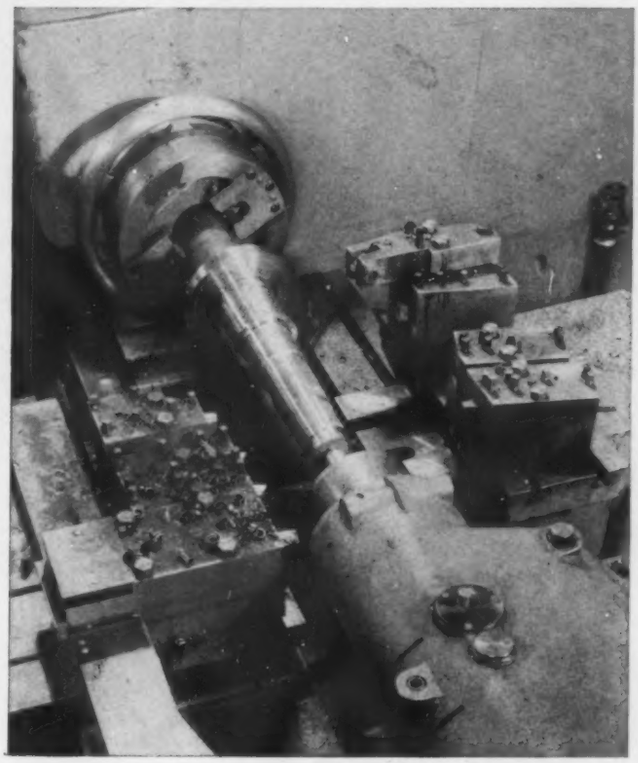
Here's the story of how a progressive tractor manufacturer made use of Sundstrand "Engineered Production" to increase his production on some heavy turning jobs. One part, a track sprocket shaft, is an SAE 1045 steel forging. It is annealed, milled to length and centered on both ends before turning. This shaft is now completely turned in two set-ups on Sundstrand Model 16 Automatic Lathes which have ample H.P. to make full use of multiple tooling and T.C. tipped tools together with quick cycle change-over and complete automatic cycling. Production on the Sundstrand's is 8 shafts per hour as compared to 1.625 shafts by the former method.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Total Production Increased 492%

In addition to reducing the actual machine cycle time, additional savings have been effected through simplified handling and tool maintenance to bring the total production increase on the job up to 492%.



Close-up of tooling for rough turning, facing and forming track sprocket shaft with 9 t.c. tipped tools.

The previous production of 1.625 shafts per hour was obtained with 3 machines using H.S.S. tools compared to the new method using 2 Sundstrand Model 16 Automatic Lathes with T.C. tipped tools.

This is another interesting example of Sundstrand Engineered Production applied to turning . . . the proper method first and the application of the right machine to suit the method.

See This and Other Sundstrand Machines in Action In Booth No. 20

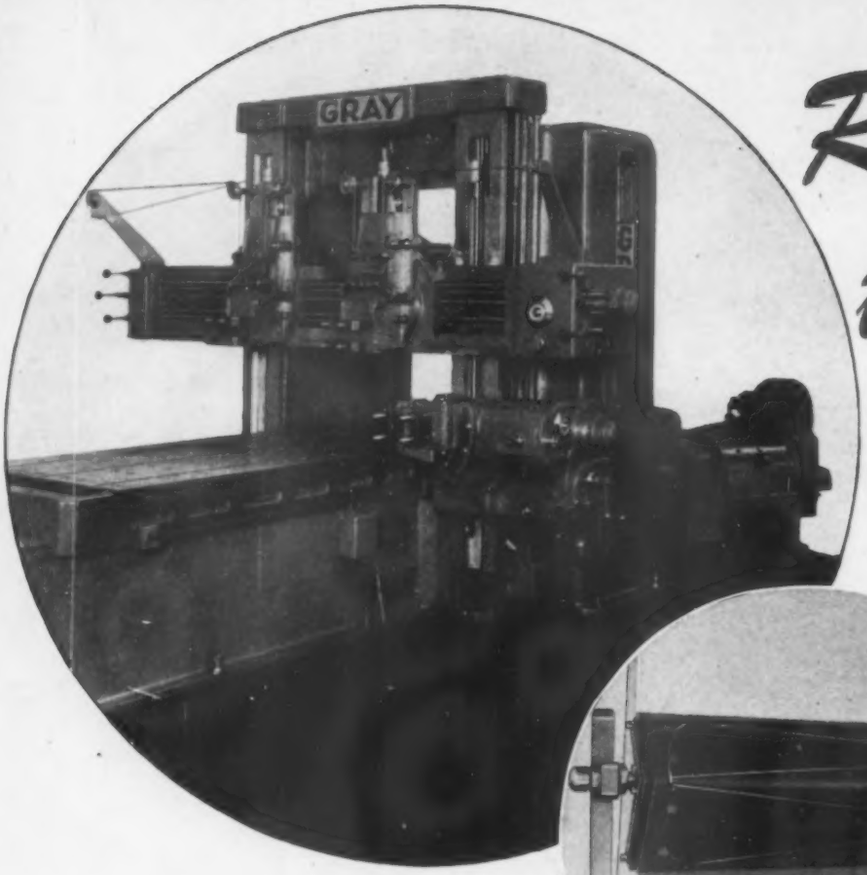
at the machine tool show in September. Sundstrand "Engineered Production", the most practical way of solving metal working production problems, will be clearly illustrated and demonstrated at the show. This new standard Sundstrand 75 horse power automatic lathe will be one of the machines demonstrated in our Booth No. 20 at the Dodge Plant, Chicago, September 17th through September 27th. Be sure to see these machines.

How You Can Save Time on Turning Large Parts

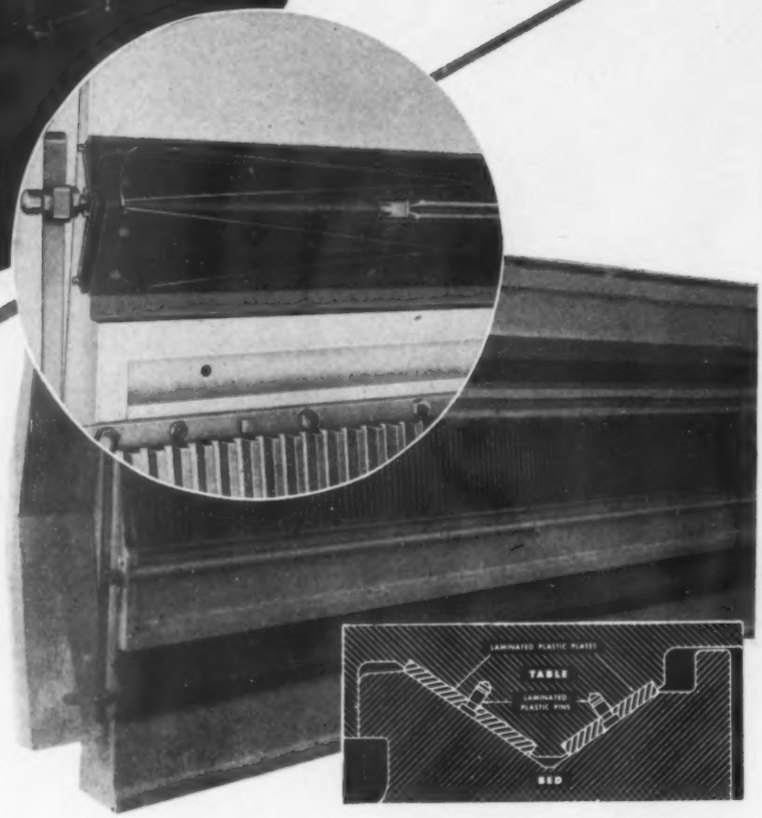
is further explained in this free foldeer covering engineering data and specifications on the new Sundstrand Model 16 Automatic Lathe. Write for your copy today. Ask for Bulletin 162.

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



Reap the Benefits



GRAY

NON-METALLIC WAYS*

insure freedom from scoring and make feasible increased speeds and table loads.

Remember—

"A Planer is no better than its Ways"

* Protected by Patent 2,378,343 and Patent Pending.

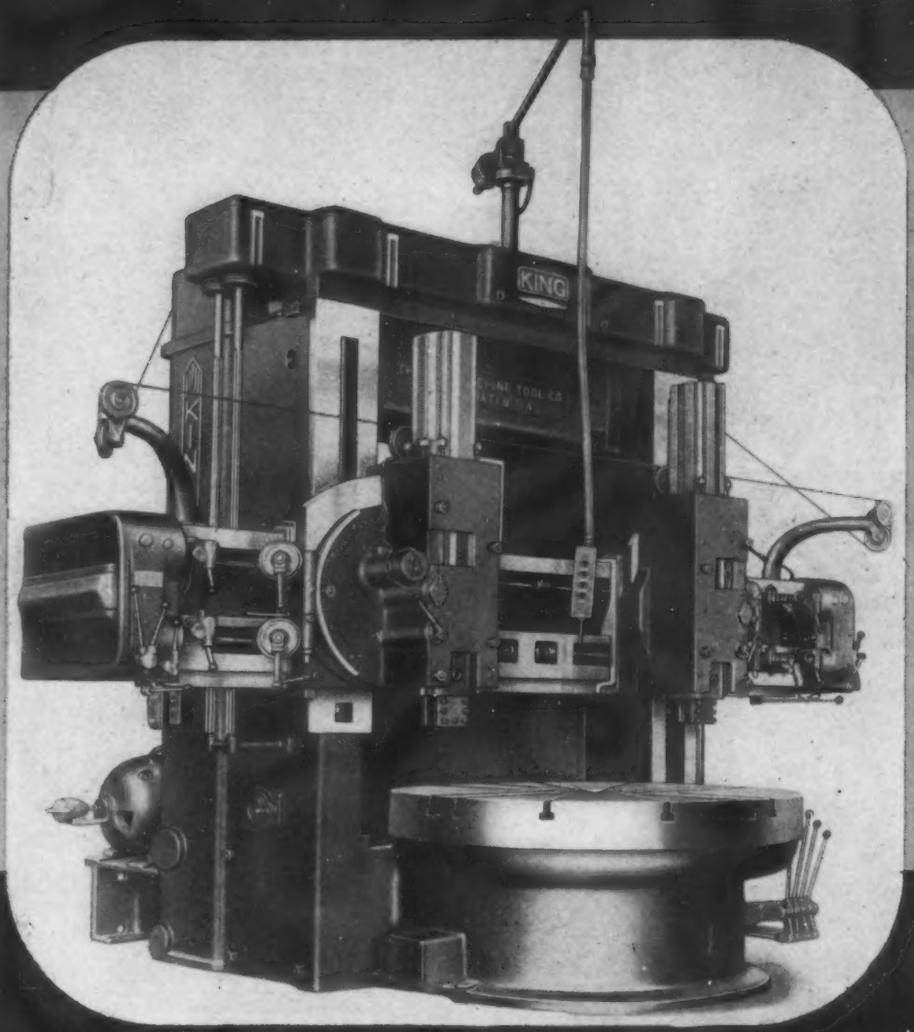
Scored Ways is the thief that robs your planer department of its accuracy. Drive him out of your plant by insisting on GRAY NON-METALLIC WAYS—the Way that will not score.

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

NO BOTTLENECKS IN PRODUCTION



with the

NEW SERIES KING

on the job

● Where there are boring, turning, counterboring, facing and similar operations on your work the new series KING eliminates possibility of bottlenecks in production.

There are several good reasons for this. The new series KING being substantially heavier—having the rigidity essential for the successful use of carbide tools—so designed that operator has all controls at his fingertips—assures a continuous flow of precision work day after day.

And the ease of control and wide range of table speeds available accounts for many minutes saved on every job. This means less time to complete the job and a substantial reduction in the cost per piece.

Consult a King engineer on your work requiring boring, turning, facing and similar operations.

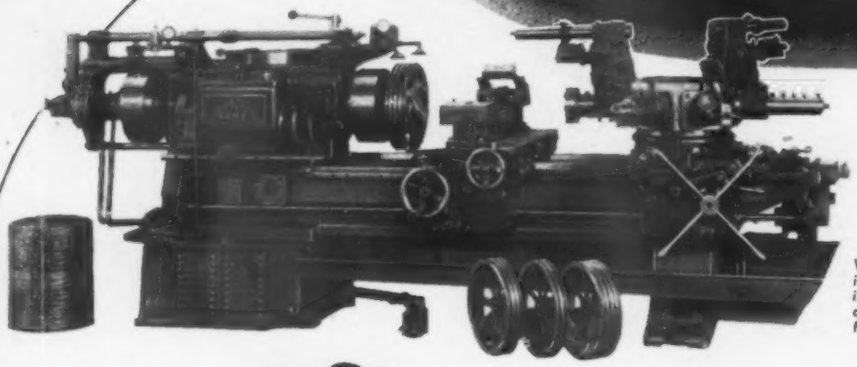
King offers 10 sizes—30″, 36″, 42″, 52′, 62″, 72″, 84″, 100″, 120″ and 144″.

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

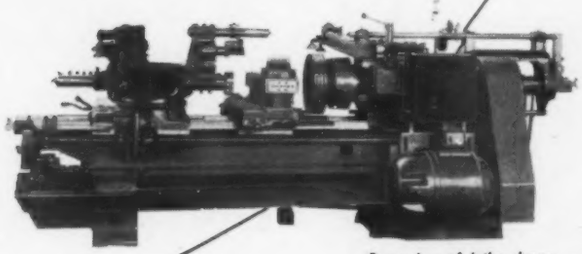
Builders of Vertical Boring and Turning Machines Exclusively

FROM A SINGLE CHUCKING a finished sheave.....



V-sheave set-up . . . castings are held with air chuck, internally gripped . . . front and back tool blocks carry forming tools.

Lodge & Shipley ACME



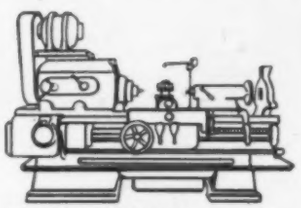
Rear view of lathe shown above. Back facing of hub is done by a special back facing tool operated through the spindle.

● An intricate machining job is the multi-groove sheave . . . but amazingly easy on the Lodge & Shipley Acme Turret Lathe. On the set-up illustrated above, a Model 3-S Universal Turret Lathe starts with a rough casting . . . ends with a finish-part . . . without rechucking.

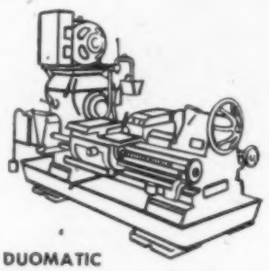
● Automatic multiple-tool operations rough bore, ream and drill; rough turn the O.D. and faces; roughs out the grooves; bore and face both hubs. Similar operations finish turn the casting after indexing of the turret.

● And this is but a single example of the improved methods of tooling and machining possible with Lodge & Shipley Acme Turret Lathes. With the dollar's worth of machine production of ten years ago costing, on the average $1.35 today . . . the advantages of these Lathes are increasingly important to cost-and-competition-minded executives.

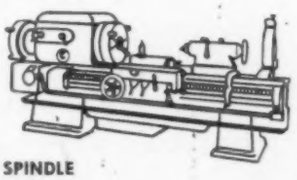
● Investigate today. Ask your nearby Lodge & Shipley Engineer to furnish complete details on this and other jobs . . . all proving conclusively the profit possibilities of Lodge & Shipley Acme Turret Lathes. Write for complete catalog.



ENGINE, TOOL ROOM AND MANUFACTURING LATHES



2A and 3A DUOMATIC (automatic) LATHES



HOLLOW SPINDLE LATHES

THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN

SPECIAL PRODUCTS DIVISION • 800 EVANS ST.

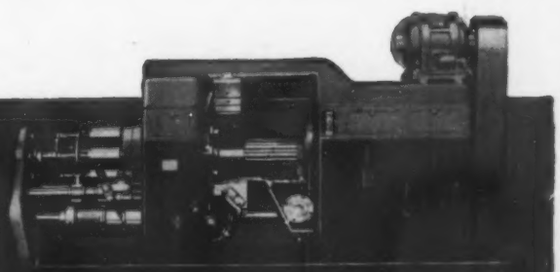
FOR BIG ONES

ACTUAL SIZE

OR LITTLE ONES

ACTUAL SIZE

THIS MACHINE WILL GIVE YOU FINE FINISHES *FASTER*



To meet today's rising production costs and still show a profit takes more than men, machines and materials.

Time is the big factor.

And that's where we can help you. If you're paying good money for finishing operations after parts leave the automatic, we can show you how to cut costs—without cutting quality.

Acme-Gridleys have the stamina for fine tolerances at high speed—and the versatility of tooling methods that eliminate many secondary machining operations. Examine the job facts listed—then ask us to show you how Acme-Gridley timesaving methods can be applied to your production jobs.

JOB FACTS

1 The big part is an automotive steering stud. Machine time is 40 pieces per hour, for eleven operations, including shaving ball and taper, and threading with ground-thread circular-chaser Vers-O-Tool. 2" dia. x 6½" long —SAE 4620 steel.

2 The little part is a telephone receiver shaft. Machine time is 800 pieces per hour, for eleven operations, including milling the flats, knurling, and shaving the bearing ends to within .001" limits. 9/32" dia. x ¾" long —steel.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

SEE THIS EQUIPMENT DEMONSTRATED
Booth 628
Machine Tool Show
CHICAGO—SEPT. 17-26

X marks the spot we hope to

WARNER & SWASEY EXHIBIT

Booth No. 309

1947 Machine Tool Show

Chicago • September 17—26

This gigantic Machine Tool Show—the first in 12 years—is one of the most momentous industrial exhibits ever held. The whole world is starving for goods. These goods can be delivered in time, in volume, and at low cost only through more efficient production that depends basically upon better machine tools.

Warner & Swasey will display and demonstrate new machines, new accessories, new chucks, new tools and methods which may be the right answer to your production problems.

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND

where meet you!

You can machine it better, faster, for less... with a Warner & Swasey

MORE GOODS FOR MORE PEOPLE · AT LOWER COST ·

WARNER & SWASEY
Machine Tools
Cleveland

THREADING MACHINES

"I like to PRODUCE ...not work problems"

the GISHOLT Speed Selector *does the figuring!*

No wonder turret lathe operators like the Gisholt Speed Selector. ***Without it, here is what they have to do to get the proper spindle speed:***

1. Take the diameter to be cut and multiply it by 3.1416 to get the circumference.
2. Refer to tables to get the proper cutting speed in feet per minute for the material, based upon depth of cut, tooling and feed.
3. Divide cutting speed by circumference at cutting point to figure the proper spindle r.p.m.
4. Get the spindle revolving at that speed by means of manual control.

All this the Gisholt Speed Selector eliminates. The operator merely turns the hand wheel to the diameter of the cut. The machine automatically responds with the proper spindle speed.

Nobody wants to do it the hard way any more. That's why the Speed Selector is now standard equipment on Gisholt Turret Lathes.

THE HYDRAULIC SPEED SELECTOR, *now standard on Gisholt Turret Lathes, is another important improvement in the interests of greater production and lower machining costs. Ask for complete information.*

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and semi-round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 3, Wisconsin

Be sure to see all the new advancements in the big Gisholt exhibit at the Machine Tool Show

1947 MACHINE TOOL SHOW

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Use these **IMPROVED**

METAL-JOINING METHODS

TO PRODUCE *BETTER* • *FASTER* • *CHEAPER!*

Approximately 20 percent of all production costs in American factories can be attributed to metal-joining. So, here is an important operation to examine for possible application of improved production equipment and methods.

Westinghouse manufactures most types of metal-joining equipment—and has gained the experience of applying this equipment in a wide range of industries, as well as in its own manufacturing operations. Whatever your metal-joining problem, Westinghouse can provide the *right* equipment and methods to perform nearly any job.

On the next two pages are examples of seven *proved* production methods, already working in many plants. Any one of them may help you turn out your products *better . . . faster . . . cheaper!*

FOR EXAMPLE **. . . If you assemble small parts in your plant:**

1. Must you increase production and cut costs in joining sheet metal?
2. Do you need a mass-production method of joining small but heavy metal pieces of uniform sizes?
3. Are castings slowing down your production . . . by slow deliveries, rejections, weight or bulkiness?
4. Do you need a quick and cheap method of joining copper or copper-alloys without the use of flux or acid?

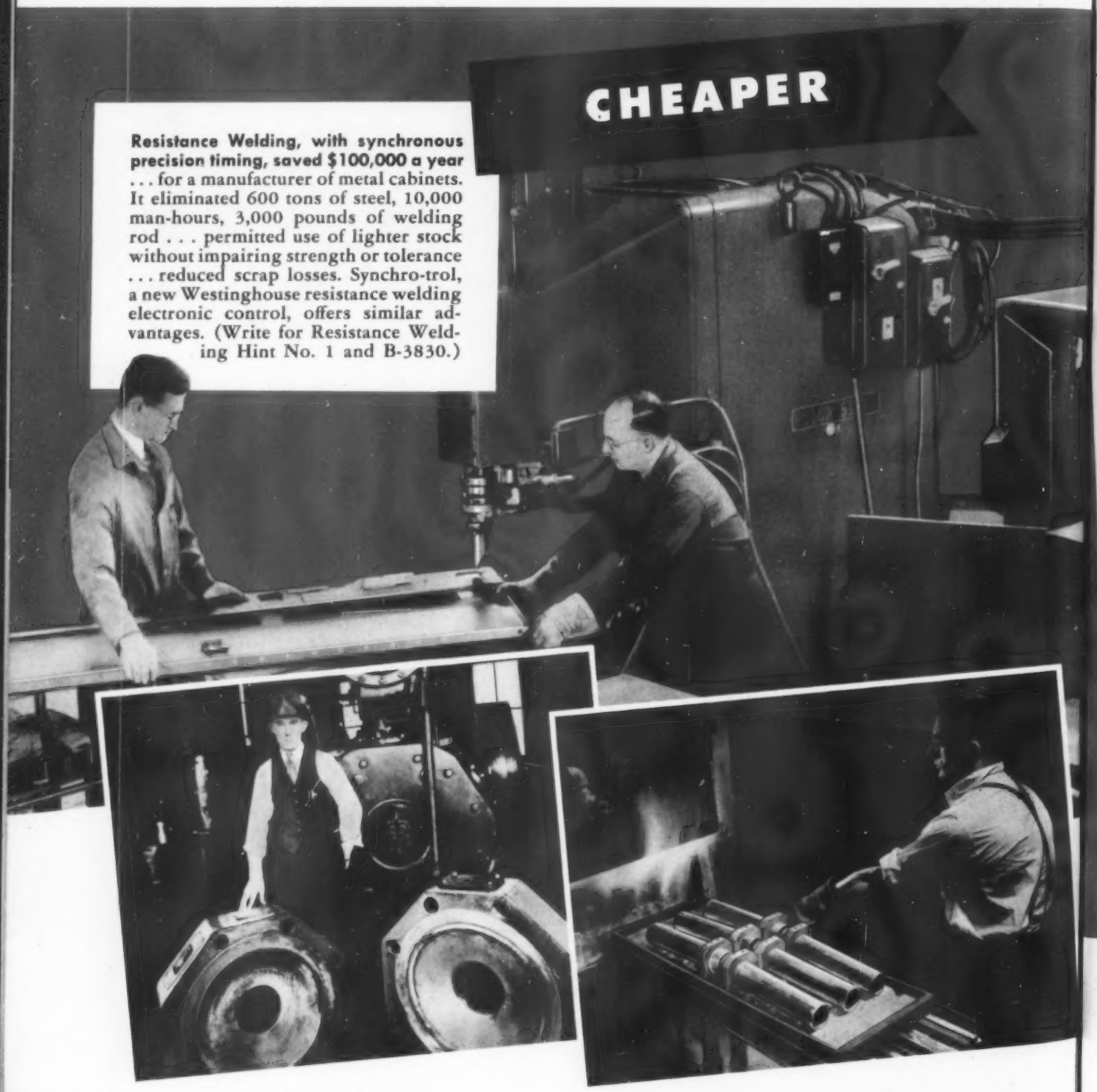
For answers to questions like these . . . turn the page

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Investigate these PROVED METAL-

TO CUT COSTS, SAVE TIME,



Resistance Welding, with synchronous precision timing, saved $100,000 a year . . . for a manufacturer of metal cabinets. It eliminated 600 tons of steel, 10,000 man-hours, 3,000 pounds of welding rod . . . permitted use of lighter stock without impairing strength or tolerance . . . reduced scrap losses. Synchro-trol, a new Westinghouse resistance welding electronic control, offers similar advantages. (Write for Resistance Welding Hint No. 1 and B-3830.)

$85.00 savings per unit by A-C Arc Welding . . . when this company switched from casting cylinder heads to welding them of ¾" boiler plate. Results: *better, stronger* cylinder heads . . . and *200 pounds of weight eliminated.* (For more information, write for B-3548.)

Electric Furnace Brazing cut factory costs 52% on this pump muffler by brazing separate baffles to the outer shell, instead of casting the unit as a single piece. (For equipment details, write for descriptive data DD-28-140, 28-450, 28-460.)

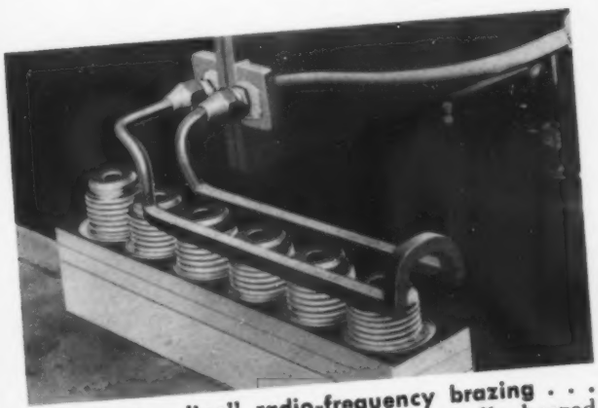
JOINING METHODS

IMPROVE PRODUCTS

Here are seven examples of metal-joining that have helped make products better, faster, cheaper. Each is a potential cost-cutter for you. For more detailed information on any of these metal-joining methods—call your Westinghouse office.

FASTER

18 pieces assembled and brazed into 6 units in 7 seconds by induction heating . . . with the aid of a simple jig. The normal method of flame brazing this steel tube assembly required two minutes to complete *one assembly of three pieces.*



"Production line" radio-frequency brazing . . . these copper bellows are automatically brazed as a conveyer carries them through the work coil. Apparatus: radio-frequency generator, work coil and conveyer. (Write for B-3620.)

BETTER

Phos-Copper joints improved pressure resistance of joints as shown by this pressure test photo. The joints between the bronze caps and copper tube were still tight and sound when the tube burst at 2,200 psi. (Write for B-3201.)

Automatic Welding and work handling equipment . . . in motor manufacture reduced frame size 35% . . . increased power capability 116% per pound . . . tripled production. For further information, call your nearest Westinghouse office.

FOR MORE PRODUCTIVE POWER...LOOK TO

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

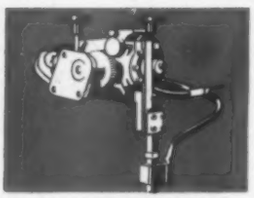
HERE'S THE COMPLETE LINE OF WESTINGHOUSE METAL-JOINING EQUIPMENT

FOR ANY METAL-JOINING PROBLEM Westinghouse OFFERS YOU

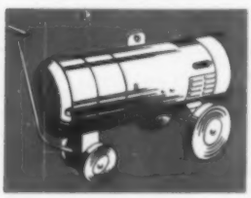
THE RIGHT EQUIPMENT..APPLICATION HELP

R. F. Heating Generators are built in ratings of 5, 10, 20, 50, 100 and 200 kw for induction heating. Work handling equipment available for all metal-joining applications.

A-C Arc Welders range from 100 to 2,000-ampere capacities to handle everything from lightweight, mass-production welding to heavier structural and fabrication welding.



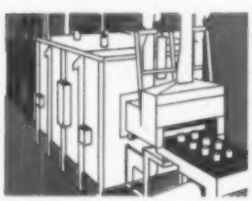
A-C Automatic Welding Heads—feed electrodes to the work continuously at an accurately controlled rate. Unit automatically starts and stops. Ideal for mass production.



D-C Flexarc Welder . . . Single operator, portable or stationary motor or engine-driven sets. Available in maximum ranges up to 200 amp, 300 amp, and 400 amp.

Resistance Welding Controls . . . SYNCHRO-TROL and WELD-O-TIMER . . . available for synchronous and nonsynchronous operation. Combinations to meet special needs.

Electrodes and Accessories . . . a complete range of electrodes for every type of welding, and all accessories needed—for both machine and operator.



Electric Furnaces—20 models for brazing and heat-treating metals. Five basic types of gas atmosphere generators also available, providing nine varieties of gases.

Phos-Copper is manufactured in rod, ribbon and special shapes which are particularly useful in torch, resistance, furnace and induction brazing. For copper alloys only.

Solder Pots . . . 10-pound and 50-pound solder capacity. 3-heat snap switch (on 10-pound size) with temperature range up to 950°F. Fully insulated.

APPLICATION ENGINEERING

Westinghouse Application Engineering Service is available to help solve metal-joining problems in your plant. Broad industrial experience gained in our own and customers' manufacturing operations is yours for the asking.

RESEARCH

The scope of Westinghouse research reaches into every industry. Wherever power is used and distributed, this research has played an important role in doing jobs *better, faster, cheaper.* Westinghouse research facilities are available at any time to help you use new production tools and apply scientific knowledge in finding practical solutions to production problems.

TRAINING MATERIAL

Westinghouse training material covers instruction courses in such subjects as electronics and resistance welding, radio-frequency heating and arc welding. It also includes everyday help in all phases of the operation and maintenance of modern electrical equipment. This help is available in the form of *printed literature* and *training films.* Ask your Westinghouse office for full information.

MAINTENANCE

A nationwide organization of 34 Westinghouse Manufacturing and Repair Plants offers speedy, effective help on all types of electrical service and repair. A skilled staff of specialists, available through your near-by Westinghouse office, is ready to help you at any time.

J-90569

Mail this coupon for more information

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____R. F. Heating	____D-C Welding	____Electric Furnaces
____Resistance Welding	____Automatic Welding	____Solder Pots
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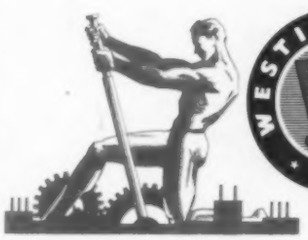
Title_____

Address_____ City_____ State_____



PRODUCTIVE POWER

Litho in

GREENLEE

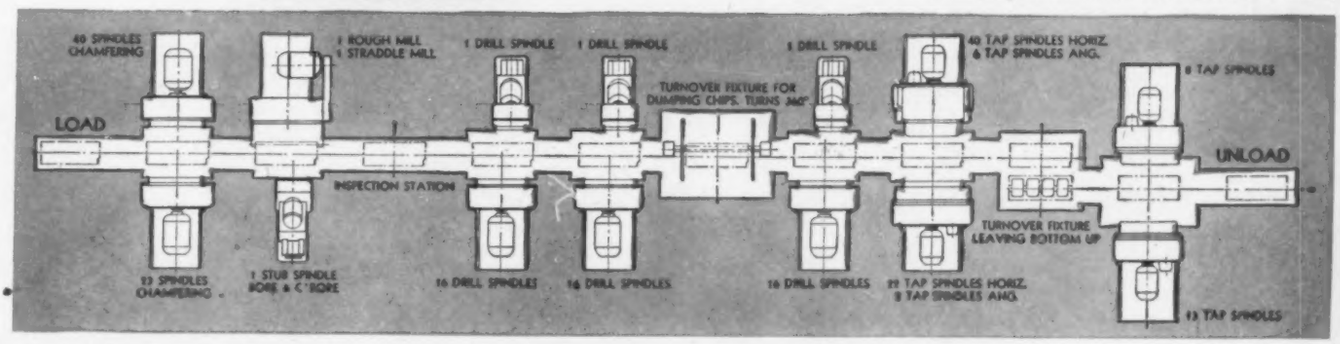
VIEW AT UNLOADING END

VIEW FROM LOADING END

AUTOMATIC TRANSFER MACHINE

Processes 75 CYLINDER BLOCKS PER HOUR

Here is the latest of the many transfer-type machines which Greenlee has designed and built during the past 12 years. A 12-station unit, it is one of a battery of 4 Greenlees now used to increase productivity and cut costs in machining automobile cylinder blocks. It performs 209 operations in a cycle time of 37.9 seconds. It drills 51 holes, bores 1, counterbores 1, chamfers 63, taps 91, and performs 2 milling operations. Operations are entirely automatic from start to finish.

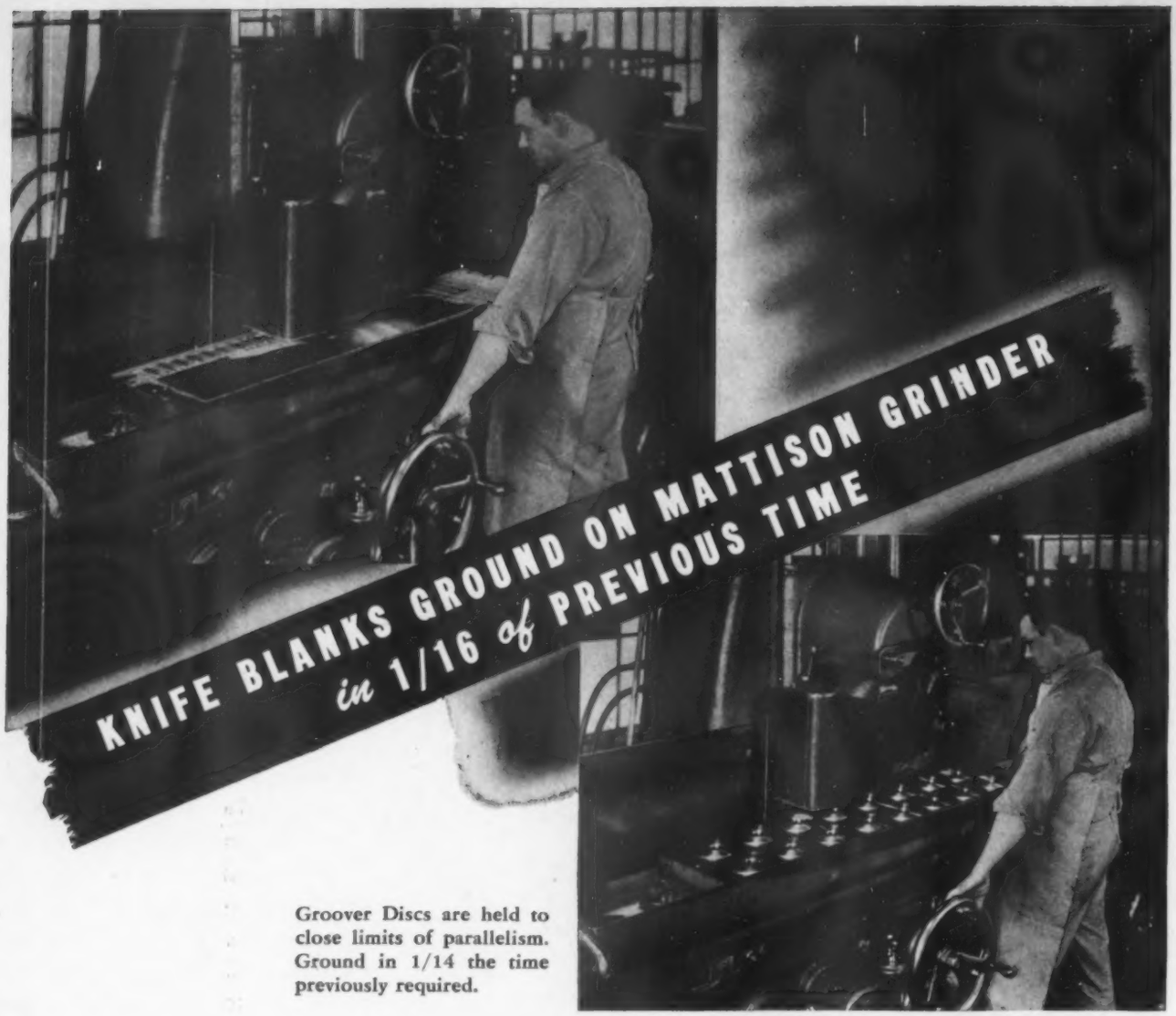


GREENLEE BROS. & CO.
1727 MASON AVE., ROCKFORD, ILL.

PRODUCTION MACHINERY
GREENLEE

As shown in operations chart, two turnover fixtures are built into this machine — one for dumping chips, and one for setting the block upright for side tapping operations. An added feature is the unusual accessibility and room between stations, permitting easy tooling and inspection. The reduction of work handling is typical of the results demonstrated by Greenlee Automatic Transfer Processing Machines. The rated capacity is 75 blocks per hour at 80% efficiency.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



Groover Discs are held to close limits of parallelism. Ground in 1/14 the time previously required.

● Through the use of two Mattison Surface Grinders The Wisconsin Knife Works, Beloit, Wisconsin, has been able to make substantial time savings on a number of jobs going through their plant. This is particularly true in the finishing of High-Speed Steel Knives, hardened to 64 Rockwell-C, where it is possible to finish grind in 1/16 the time previously required. Knives are ground to closer limits and a finer finish is obtained. Stock removal is .062. Knife angles are ground through means of special fixtures. Serrations are produced by crush forming the grinding wheel.

It is possible to grind the "Wisconsin" groover discs in 1/14 the time previously required. Close limits of parallelism and fine finish are requirements of this job.

High power, massive double-column support and rigidity of construction of the Mattison Grinder combine with accuracy and speed of operation to provide savings of this kind on jobs previously finished by other methods.

Mattison Grinders will be shown at the Machine Tool Show in Booth No. 46.

WRITE for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

New 21-ton automatic crankshaft lathe relies on Timken bearings

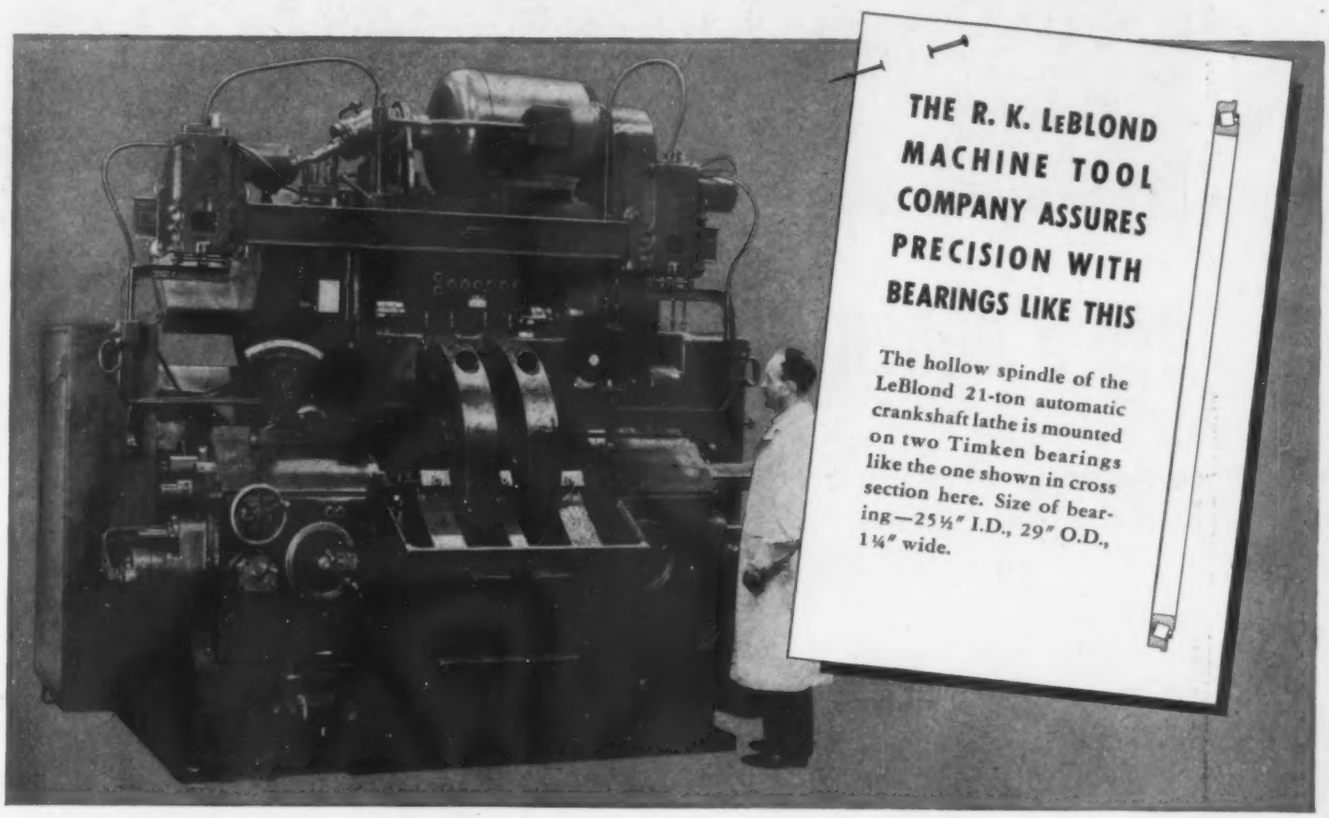
PERFORMING fast, precision machining operations automatically on automobile crankshafts requires a high degree of spindle rigidity and accuracy. That's why in the 21-ton LeBlond automatic crankshaft lathe, the spindle is mounted on Timken tapered roller bearings.

Timken bearings may be preloaded to any desired degree to *keep* spindles accurate. The line contact between tapered rolls and races and the Timken fine alloy steel of which the bearings are made permit Timken bearings to carry heavy loads with minimum deformation and wear. Free, frictionless rotation is assured by true rolling motion, incredible smoothness of finish and precision manufacture. And the tapered construction of the Timken bearing carries both radial and thrust loads, or any combination of the two.

If the machine tools you buy or build can benefit from increased spindle rigidity and longer bearing life, get in touch with The Timken Roller Bearing Company. Because of unique design features and the fine alloy steel of which Timken bearings are made, no other bearing can give you as great a combination of advantages. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



THE R. K. LEBLOND MACHINE TOOL COMPANY ASSURES PRECISION WITH BEARINGS LIKE THIS

The hollow spindle of the LeBlond 21-ton automatic crankshaft lathe is mounted on two Timken bearings like the one shown in cross section here. Size of bearing—25½" I.D., 29" O.D., 1¼" wide.

FINISHED TO CLOSE TOLERANCES

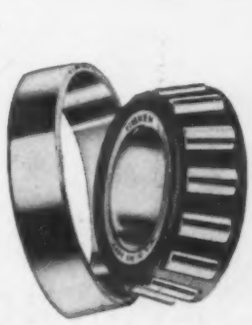
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. It's typical of the amazingly accurate manufacturing and inspection methods you find at The Timken Roller Bearing Company.

The Timken Roller Bearing Company is the only bearing manufacturer in the country which makes its own steel, and leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

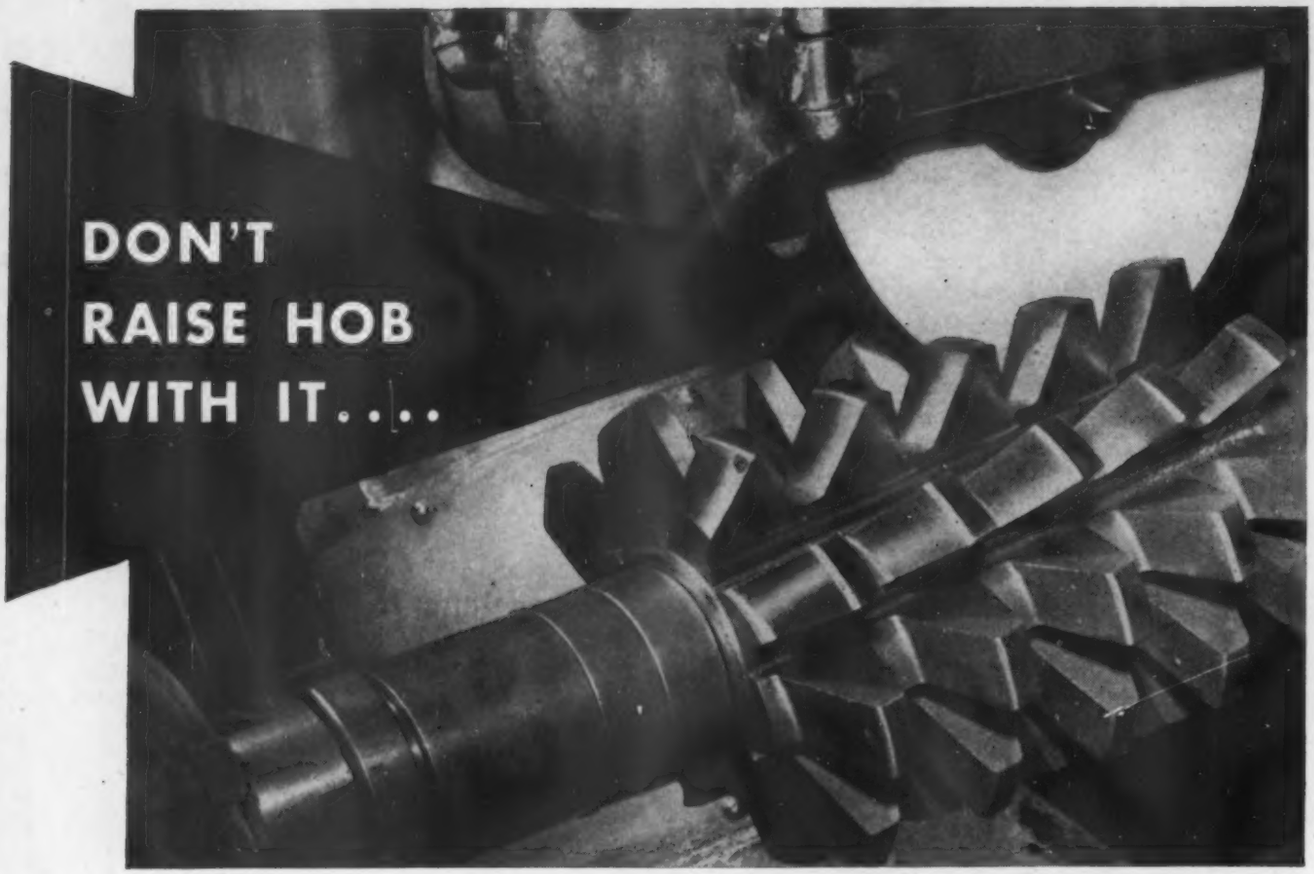
TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←



Use a ROBERTSON *Cool-Cut Wheel*

Grinding hobs, a tedious, time-consuming operation at best, becomes comparatively easy when you use a Robertson Cool-Cut Wheel. *Chip clearance?* The "open" structure of this revolutionary wheel allows more than adequate space for chip clearance! This means fast and cool grinding of hobs of any size, of the hardest steel.

Large hobs with 1½" or greater pitch may be successfully ground with a 10"x1"x1" WA46-J2V Robertson Wheel. On smaller hobs, a Robertson 7"x⅝"x¾" RA60-J2V will give highly satisfactory results. There will be no burning and very little heat generated. Experience has shown that you can expect a 50%, or greater, saving in grinding time when you use a Robertson Cool-Cut instead of a conventional wheel.

For faster and more accurate tool-grinding of any kind, make sure your grinding wheels are Robertson Cool-Cuts . . . the wheels that are precision-built for the toughest jobs. Write for your free copy of the pocket booklet "How to Buy Production Time," which tells you all about Robertson Wheels.

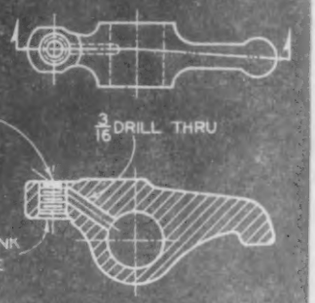
ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Manufacturers of Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

MALLEABLE IRON ROCKER ARM

PROBLEM

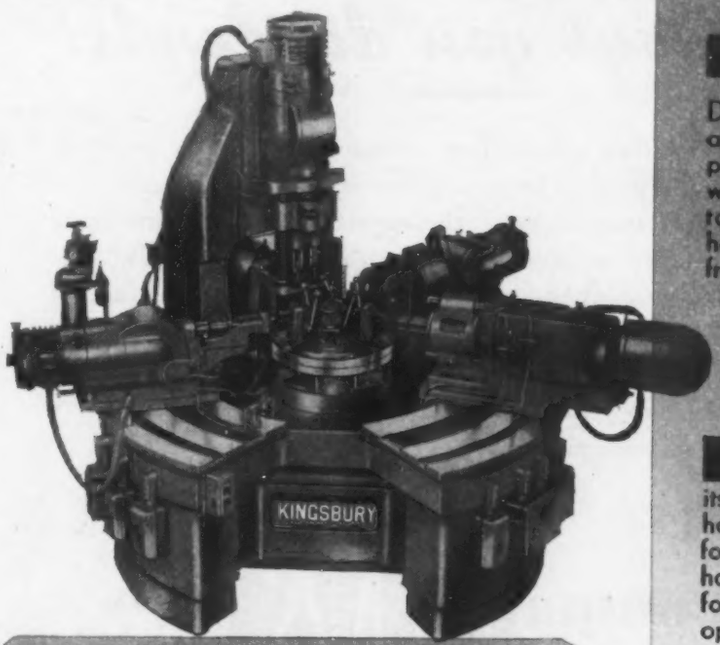
To drill, spotface, ream and tap and countersink from the bottom 380 pieces per hour — one operator.



METHOD To make sure that the angular hole is located accurately, the first drill has a guide bushing in actual contact with the spotfaced area. Drilling is in 3 steps — to keep within the time cycle and permit proper lubrication and chip removal. Four vertical units operate on the screw hole. One unit has a three-spindle auxiliary head plus an underneath countersinking attachment. Data: 20-in. index table, 10 stations. Base diameter: 80 in. Gross Production: 480 pieces per hour with one operator.

COMBINED OPERATIONS *for* HIGH PRODUCTION

If you have similar problems, send us a print showing operations and hourly output. We will quote on a completely tooled machine, ready for use. It will have standard units up to 5 hp each and will do accurate work for years at intensive production. Kingsbury Machine Tool Corp., Keene, N. H. 73

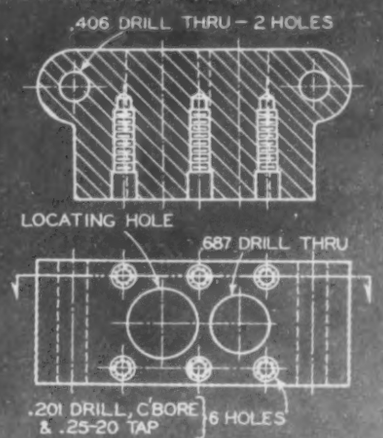


KINGSBURY

CAST IRON CYLINDER FOR REFRIGERATOR

PROBLEM

Drill, counterbore and tap 120 pieces per hour with one operator. Locate all holes accurately from large hole.



METHOD Each part remains undisturbed in its fixture until after the last operation, so that all holes will be in proper relationship. The carriers for the drill guide bushings plug into the locating hole. By using multiple spindle auxiliary heads for the parallel holes, the machine can perform all operations with only one vertical and four horizontal units operating at four working stations. Data: 20-in. index table, 5 stations. Base diameter: 80 in. Gross Production: 152 pieces per hour with one operator.

The ADAMS Line

Spur Gears
Helical Gears
Bevel and Miter Gears
Worms and Worm Gears
Internal Gears
(spur and helical)
Sprockets
Ratchets
Splined Shafts
Racks
Lead and Feed Screws
Ground Tooth Gears
(spur and helical)
Shaved Tooth Gears
(spur and helical)
Ground Thread Worms

Quality control at ADAMS *pays you dividends!*

In every stage of their manufacture, Adams precision-made gears are subjected to rigid inspections for quality control and to assure exact conformance with your specifications. The inspections go on continuously in the shop and in the modern Adams gear checking department. This careful attention to detail right down the line pays you dividends in two ways—it means fewer rejects and it means better performance for your product. When you need gears, call on Adams for high quality gears made *exactly* to your specifications. THE ADAMS COMPANY, 1942 Bridge Street, Dubuque, Iowa.

The ADAMS Compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

HAVE YOU HEARD?

Have you heard the reasons why so many people are going to the Machine Tool Show, at the Dodge-Chicago Plant from September 17th to the 26th?

More than 100,000 management, production, engineering, purchasing and financial executives will attend this first Machine Tool Show to be held in twelve years.

It's the World's Greatest Metalworking Show. It's being held in the largest manufacturing plant, under one roof, in the world.

There will be nightly sessions at which papers, covering the latest developments in metalworking techniques and processes, will be presented by world-renowned authorities.

Don't miss this opportunity to see 12 acres of cost-reducing equipment of the future—in full operation.

Send in your advance registration now. You'll avoid delay at the registration desk. If you don't have an advance registration form, write for one today.

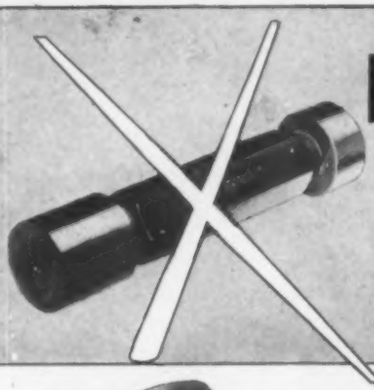
National Machine Tool Builders' Association,
10525 Carnegie Avenue, Cleveland 6, Ohio.

MORE GOODS FOR MORE PEOPLE
AT LOWER COST

MACHINE TOOL SHOW

SEPT. 17-26 DODGE-CHICAGO PLANT—CHICAGO, ILL.

MORE GOODS • FOR MORE PEOPLE • AT LOWER COST



DuBo Gages are going over!

Orders and re-orders demonstrate DuBo superiority over cylindrical plug gages

DuBo* Plug Gage

checks bores FASTER, more accurately!

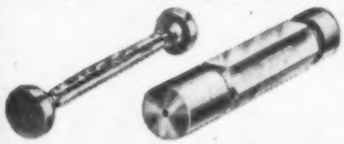
SINGLE END
Sizes 1.510" to 6.010"
(38 mm. to 152 mm.)

DOUBLE END
Sizes .240" to 1.510"
(6 mm. to 38 mm.)

Enthusiastic users all over the country are rapidly replacing cylindrical plug gages with DuBo Gages. The first use unmistakably demonstrates DuBo superiority — its extreme lightness, its ability to detect dimensional deviations (taper and out-of-roundness), its ease, speed and accuracy. STANDARD representatives in leading industrial centers will gladly arrange a demonstration for YOU.

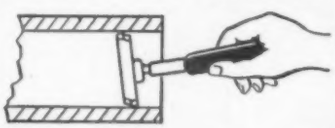
WRITE FOR BULLETIN *Patents Pending

LIGHT IN WEIGHT



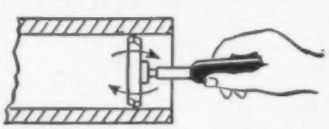
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size. Lighter weight means less fatigue, greater accuracy.

EASY TO ENTER



DuBo is entered easily by tipping handle slightly above bore axis (no jockeying necessary). Enters even under-sized bores easily.

DEFINITE CHECK



Enter gage, rock handle gently, bringing spherical gaging surface in contact with bore wall. Whether or not handle drops freely below center is definite yes-or-no answer.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

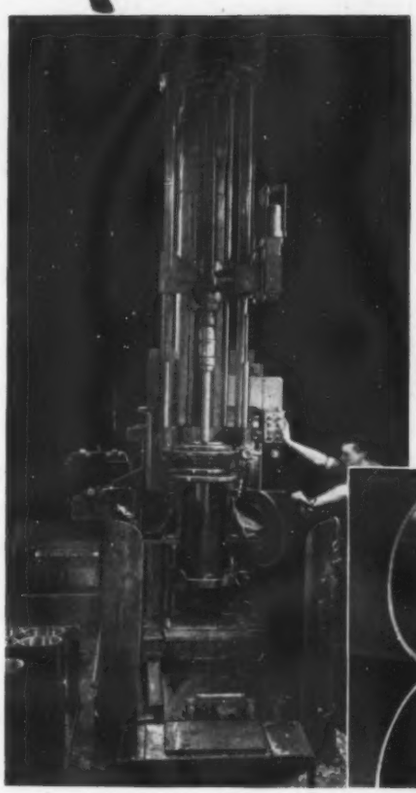
LIFT POWER FROM *Controlled* FINISH

ANTHONY LIFT GATE HYDRAULIC

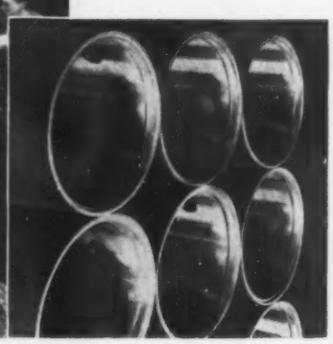
BARNESDRIL HONING MACHINES CONTROL SIZE AND SURFACE UNIFORMITY IN VOLUME PRODUCTION OF HYDRAULIC CYLINDERS . . .

The Anthony Company, Streator, Illinois, manufacturers of hydraulic lifting equipment for truck bodies, tractors, and farm machinery, insist on having the finest finished hydraulic cylinders in their industry. The performance of these cylinders requires that they must operate dependably under heavy loads, without loss of hydraulic pressure, and with long service and a minimum of service attention. Volume production is essential to maintain reasonable costs, and rigid control over quality of surface finish and accuracy is a necessity.

To insure absolute uniformity of surfaces, and to maintain the exceedingly close limits on size, out-of-roundness, and taper, they are using BARNESDRIL Honing Machines for finishing and final-sizing all of their cylinder bores. These cylinders range in size from 5″ to 7″ in diameter, 23¼″ to 42″ in length, and are made of .30-.40 carbon H.R. seamless steel tubing. Tubes are bored within .010″ of finished size, and then honed to remove final stock and apply uniform surface finish. Economy and production efficiency are shown in the total finishing time which varies from 3½ minutes for cylinders 5″ x 23¼″ ,to 9 minutes for cylinders 5″ x 42″.



● View of No. 4014 Vertical Single Spindle Honing Machine Sizing and Finishing Hydraulic Lift Cylinders.



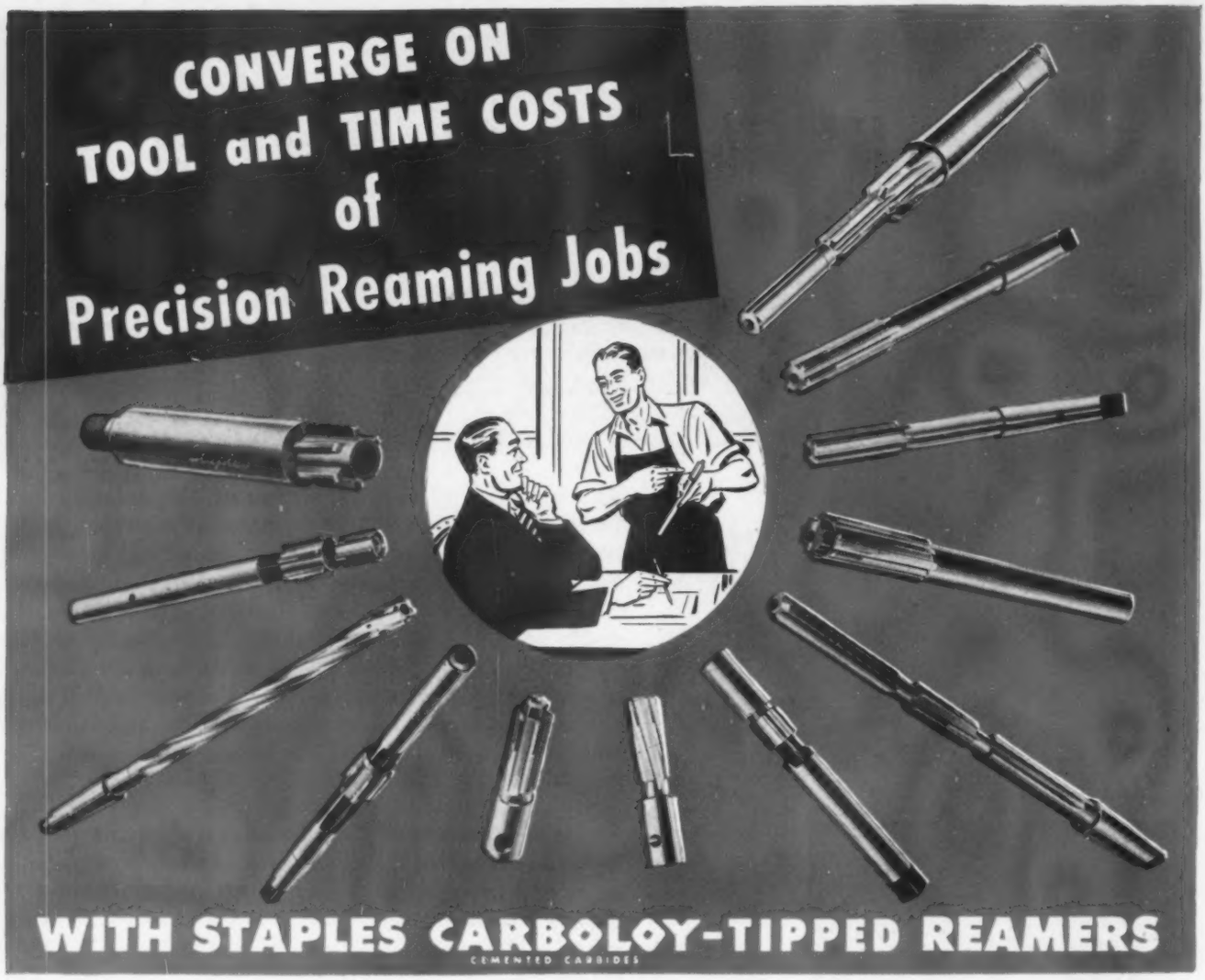
● Finish Honed Cylinders have uniform smooth surfaces, accurately sized within .0005″, and free from any roughness or unevenness which may cause abnormal wear.

BARNESDRIL Machines accomplish both sizing and finishing in the same operation, which provides a definite production saving. At the same time they make it possible to control the degree of these operations, quickly and easily, and on a volume basis for low cost. A BARNESDRIL Field Engineer will be glad to help you determine the value of these advantages on metal-finishing problems in your plant. Ask him to make an appointment at your convenience.

Write for Bulletins on BARNESDRIL Honing Machines and the Honing Process. Ask for Bulletin No. B-1214.

BARNES DRILL CO.

830 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.



If you have a precision reaming job, Staples has the reamer for it. Staples Solid and Expansion Reamers are precision engineered to consistently produce accurate, fine finish holes throughout exceptionally long production runs. These tools far exceed H. S. S. on tool life; require a minimum of servicing.

High quality production standards enable Staples to maintain closer tolerances in reamer size, straightness and concentricity. Staples Reamers are produced to a total tolerance of .0003″ on diameter. All carbide surfaces are diamond wheel finish ground and diamond lapped to size. Finish ground flutes assure free chip passage.

By replacing with Staples Standard or Special (designed-to-job) Reamers on routine and complex operations, many manufacturers have cut tool costs, gained improved tool performance, and have eliminated frequent, costly down time. *Your* production may also benefit. Call in a Staples Tool Engineer for an on-the-job demonstration. There is no obligation.

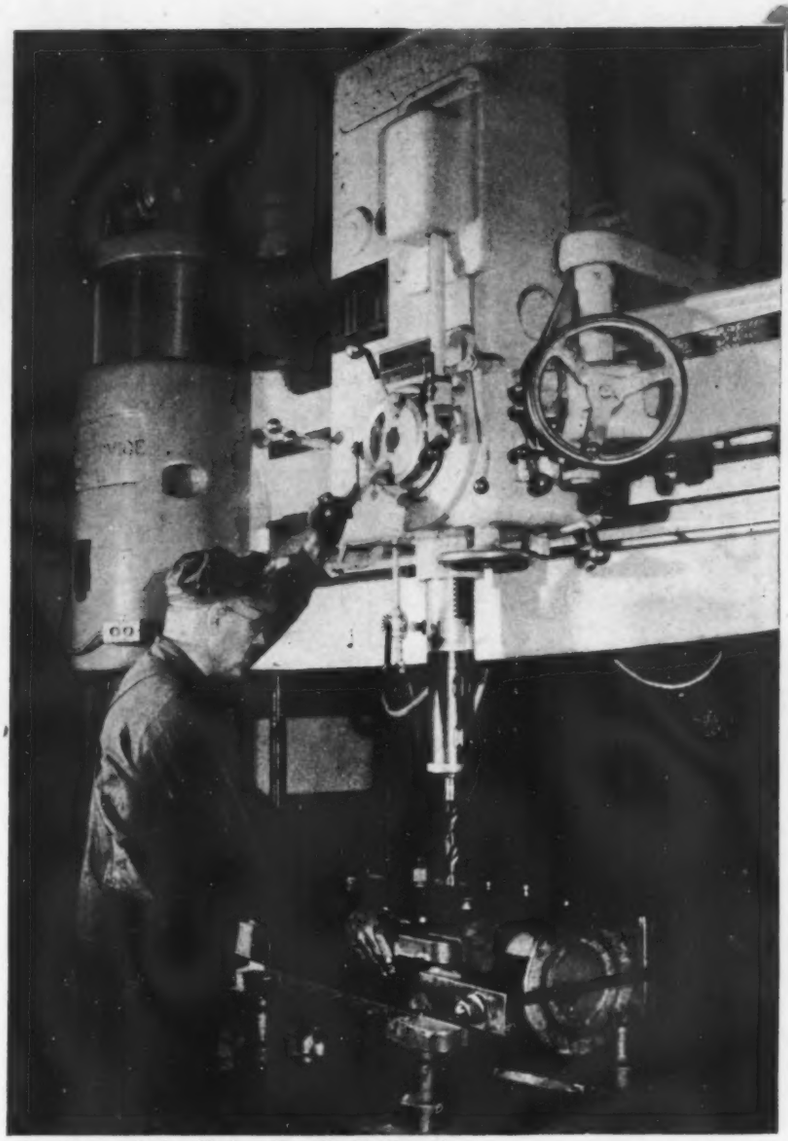
THE STAPLES TOOL COMPANY
CINCINNATI 25 **OHIO**
Distributors in Major Cities

write for your complete Staples Tool catalog

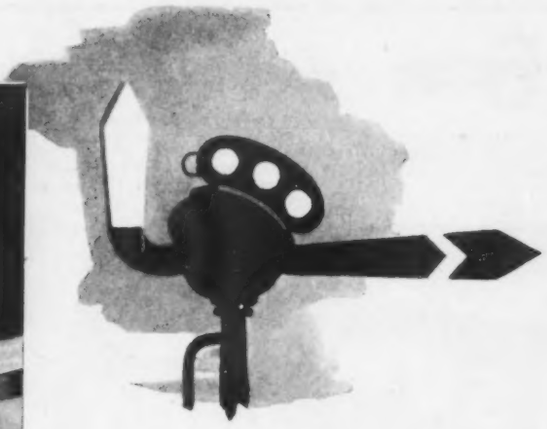
Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

MANY MILES TO TRAVEL...



Courtesy of the Union Pacific Railroad



A locomotive crosshead has a job to do, and many miles of perfect performance are a must. Workmanship must be right.

This Cincinnati Bickford Super Service Radial Drill—accurate, dependable, easy and sensitive to the operator's control, is at work in a Union Pacific Railroad shop at Omaha, Neb.

Design features of Cincinnati Bickford Super Service Radial Drills make them profitable machines, either in high production work, or where versatility is needed.

Write for detailed Bulletin R-24A.

•

See our condensed catalog in Sweet's File.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Line reamer bushings, diameter 2.375", accuracy held to .0001".

Cast iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Carburetor Idler Valve Jet. Hole is honed after reaming for smooth action.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

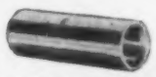
Inner Bearing Ring. "Accurately removes last 'tenth' of stock."

Diesel Engine Fuel Injector Cylinder. "So accurate that a piston can be fitted within .00005"."

Universal bearing honed to 10 micro-inch finish gives longer service.

Compressor Yoke. Alignment maintained and better finish produced.

Hydraulic Brake Cylinder. Produced a straighter hole in one-third the time required for lapping.



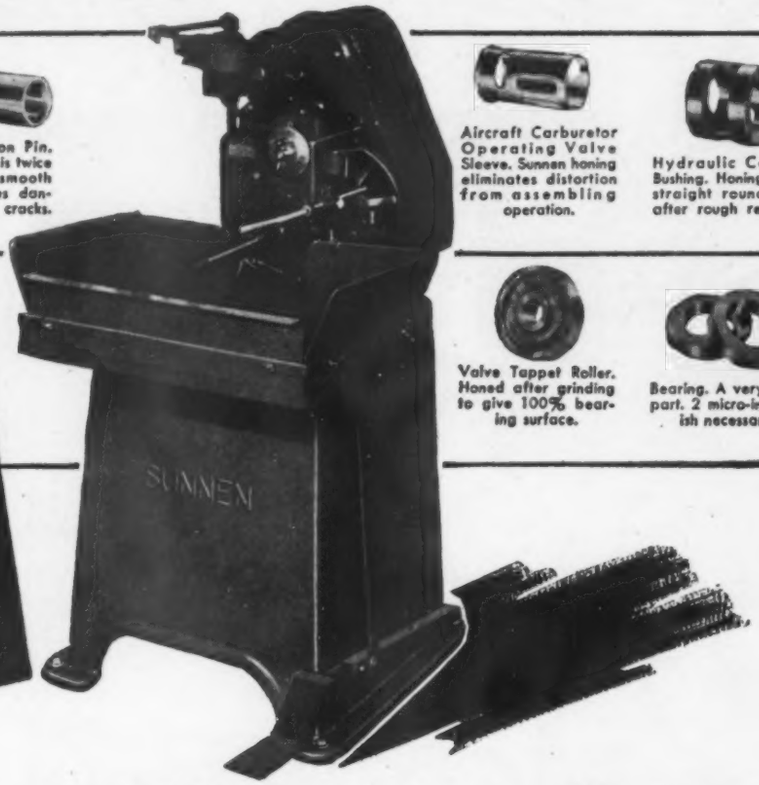
Aircraft Piston Pin. Sunnen honing is twice as fast and smooth surface reduces danger of stress cracks.

Aircraft Carburetor Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Bearing. A very small part. 2 micro-inch finish necessary.



SUNNEN *Precision* HONING MACHINE

Will Solve Your Problems of Producing Straight Round Holes... *Quickly, Economically*

If your plant produces parts of steel, cast iron, aluminum, bronze, plastic, ceramic or glass — and if these parts have holes that must be accurate and smooth, the Sunnen Precision Honing Machine will save time and money for you. These machines are being used in hundreds of factories to size and finish holes from .120" to 2.625" in diameter in tools, dies, jigs, fixtures, thousands of production parts — and for maintenance and salvage operations.

Accuracy is guaranteed within .0001" — more accurate than lapping and from 3 to 10 times as fast. A complete range of honing stones is available to produce any micro-inch surface finish desired. In hardened steel, a finish of 2 to 3 micro-inches can be obtained.

In addition, the Sunnen Precision Honing Machine maintains accurate alignment between tandem holes, operates without jigs or fixtures, can be set up to operate in less than one minute, corrects errors of out-of-round and taper, is easy to operate and low in cost.

Find out how you can use the Sunnen Precision Honing Machine in your plant. Write today for literature — or ask a Sunnen engineer to show you its advantages.

SUNNEN
TRADE MARK REG. U. S. PAT. OFF. • MARCA REGISTRADA

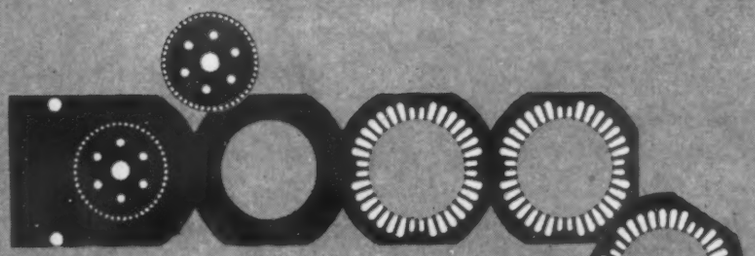
SUNNEN PRODUCTS COMPANY • 7941 MANCHESTER AVE. • ST. LOUIS 17, MO.

Canadian Factory: Chatham, Ontario

SP-240

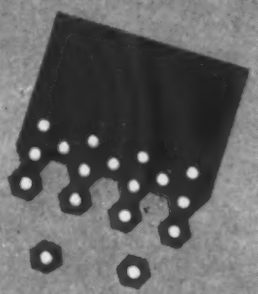
Why You Increase Output and Cut Costs

On *Bliss* High-Production Presses



.018" silicon steel—200 SPM in a No. 675-B press with single roll feed and synchronized pull feed.

.089" steel—165 SPM in a No. 675 press—two pieces per stroke.



.132" brass—300 SPM in a No. 630 press with single roll feed.

CHECK THESE FEATURES

Eliminate lost man-hours from intermediate handling between operations—Bliss High-Production Presses are specially engineered for Progressive and Compound Dies...increase output per man.

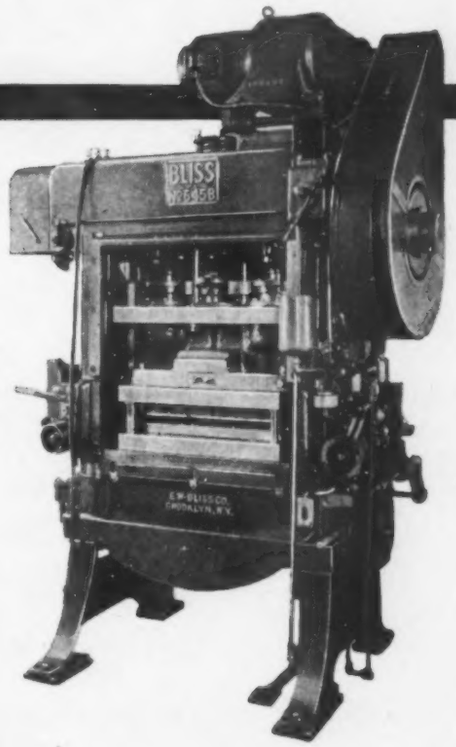
Minimize set-up time—all dies and adjustments are within easy reach of operator.

Control Speed and production ratio within the limit of tool and maintenance economy.

Step up operating pace with special feeds. Double roll or single roll feed can be mounted on right or left side of press.

Increase Die Life—slide alignment is maintained even under severe off-center loads through use of two connections and square gibbing...accurately finished.

Keep Down-time and Maintenance at a minimum—parts are easily accessible. Forced feed lubrication to all main bearings. Electric controls to supplement operator when press operates at high speed.



You don't have to speed up a Bliss High-Production Press until it cries "Uncle" to increase output and cut costs. In engineering it, Bliss didn't stop with increased strokes per minute but, what's more important, made possible higher ratio of productivity...greater press output. Some of the ways this is accomplished on Bliss High-Production Presses are enumerated in the above chart. Check your performance against it.

The accompanying examples show complex work achieved with one stroke, one press, one man. These are but a few of the stampings produced on Bliss High-Production Presses. You, too, can increase your output and reduce costs. Start by writing today for our catalog No. 27.

E. W. BLISS COMPANY, DETROIT 2, MICH.

Mechanical and Hydraulic Presses, Rolling Mills, Can and Container Machinery

WORKS AT: Brooklyn, N. Y.; Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES: Detroit; Brooklyn; Cleveland, Dayton, Toledo, Ohio; Lansing, Mich.; Chicago; Philadelphia, Pittsburgh, Pa.; Rochester; New Haven; Boston; Toronto.

STAY AHEAD WITH *Bliss*

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY

A Size and Type of Wheel *for Every Weld Grinding Job . . .*

THAT'S what you'll find in the Norton line of grinding wheels—a size, shape and specification for every grinding job in the welding shop—resinoid bonded wheels in straight and cup shapes for high speed portable grinders; vitrified bonded wheels for operation up to 6500 s.f.p.m.; mounted wheels and points for the hard-to-get-at places.

Especially popular for many jobs are wheels of the sensational new 32 ALUNDUM abrasive and the new B-7 resinoid bond.

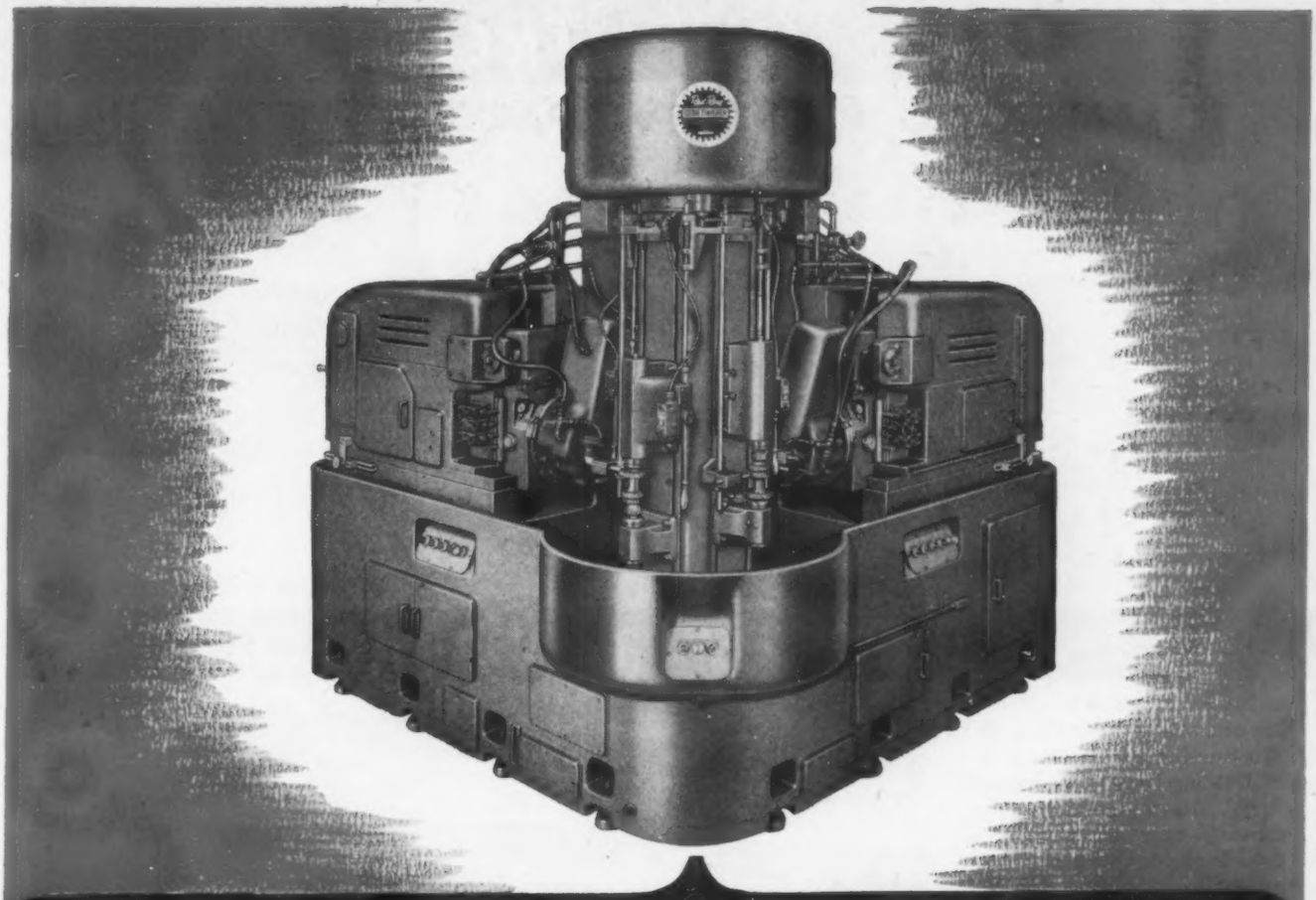
Ask your Norton distributor to select the best wheel for each of your jobs. He has a wide variety in stock. Also ask him for a copy of the revised edition of the catalog "Norton Grinding Wheels for Foundries, Steel Mills, Forge and Welding Shops" or write direct.

NORTON COMPANY, WORCESTER 6, MASS.

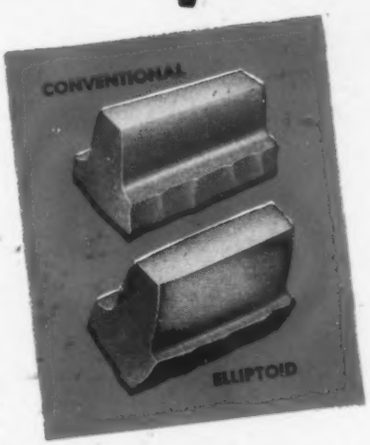
Distributors in All Principal Cities

T. M. REG. U.S. PAT. OFF.

NORTON ABRASIVES



NEW *High Production* MACHINE SHAVES TWO GEARS SIMULTANEOUSLY



The new Red Ring Turmatic Gear Shaving Machine is built for fully automatic continuous operation and requires no skill of the operator whatever. He merely loads and unloads the machine. If he should make a mistake in loading a part or try to load an oversize part, the machine stops automatically to safeguard the cutters.

Production rates have been increased 250% plus. Motions in loading the work have been cut from 10 to 4.

Either the conventional tooth form or the Elliptoid form can be produced. All movements are controlled electrically—no hydraulics. Write for descriptive bulletin on this new cost saving gear shaver.

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

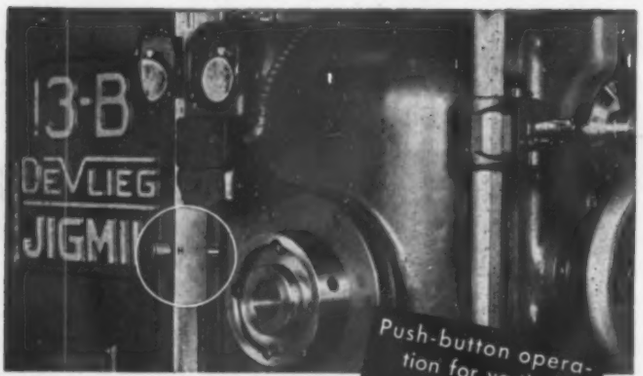
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL by DeVLIEG

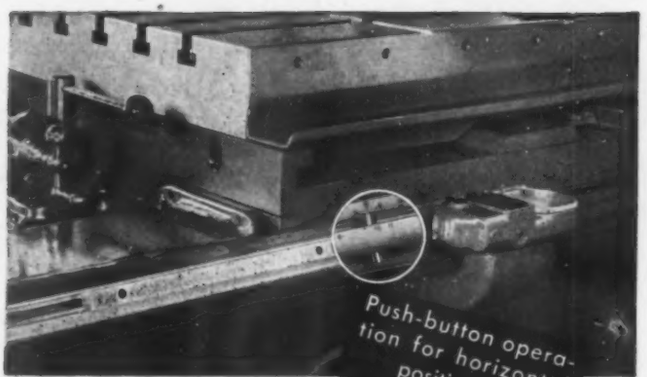
The finest known process for accurately spacing and machining holes.

THIS IS HOW IT WORKS . . .

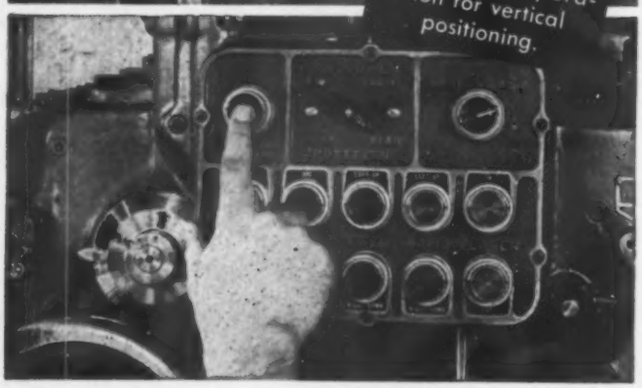
Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.

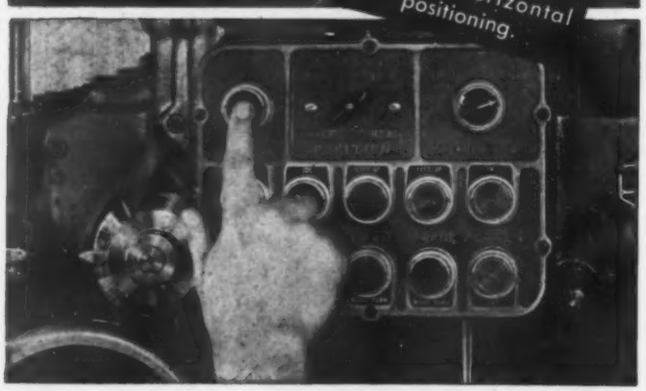


Push-button operation for vertical positioning.



Push-button operation for horizontal positioning.



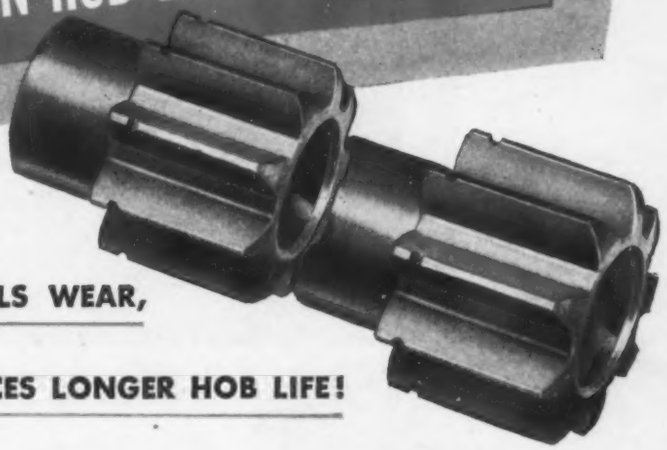


DeVLIEG MACHINE COMPANY — DEVLIEG JIGMIL — 450 FAIR AVE. FERNDALE 20, (Detroit) MICH.

SEE THIS JOB AT THE *Machine Tool Show*

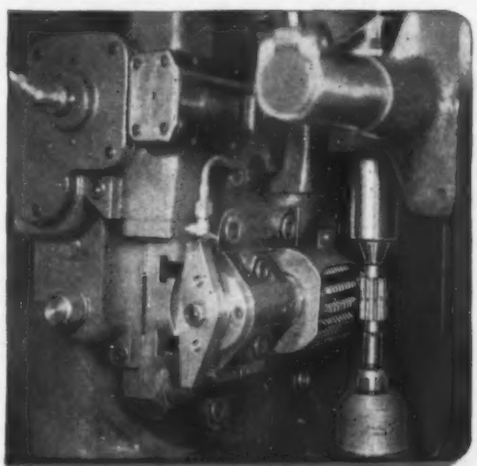
Actual Savings

79% FLOOR-TO-FLOOR TIME
75% IN HOB LIFE



HOBBING 9-TOOTH PINIONS ON TYPE V HOBBING MACHINE

NEW AUTOMATIC HOB SHIFTER CONTROLS WEAR, PRODUCES LONGER HOB LIFE!



● This job record indicates production savings possible with the Barber-Colman Type V Hobbing Machine, taking full advantage of its broad range of feeds and speeds, automatic cycle, and hydraulic operation.

Actual production time, hobbing two pinions per load, was reduced from 2 minutes, 42 seconds to 35 seconds, total floor-to-floor time. Hob speed of 207 RPM was used, with a feed of .125″ per revolution of work. Hob life, even at these higher feeds and speeds, jumped from 5,000 to 20,000 pieces because of uniform wear controlled by the Automatic Hob Shifter.

Why will the Type V maintain this kind of production day after day? Because in back of it lies constantly improved design features to minimize wear; ruggedness and accuracy to meet today's requirements for range and capacity; and easy adjustments to keep the machine in perfect mechanical balance at all times. Actually our engineers have designed and built this machine to meet the most rigid demands of any mass-production gear department.

Such production advantages, plus compact, floor-saving design, easy set-up, and ready accessability for maintenance, have made the Type V *priority equipment* for modern, high speed gear production.

Write for production estimates on this machine covering your requirements.

QUICK FACTS

Part—Pinion, 9 teeth, 10/12 Pitch, 1.085″ dia. x 55/64″ face.
Material—Steel, free machining.
Hob—Double thread, unground 4 x 4 x 1½.
Feed—.125″ per rev. of work.
Speed—207 R.P.M.
Floor-to-floor Time—35 seconds per load of two pinions.
Hob Life—20,000 pieces per hob.

See This Job in Operation at our BOOTH

Machine Tool Show, CHICAGO, September 17-26

ACCURACY-RIGIDITY-POWER BARBER B-C COLMAN FOR HI-PRODUCTION HOBBING

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

EXACTLY TO BLUE PRINT

with the

FOSDICK JIG BORER

● Precision—ease of control—flexibility the three essentials of jig borer design are features of Fosdick construction.

For example on the job shown 13 holes of various diameters located in different positions over the work are easily reached for drilling, reaming, counterboring, etc., at one setting.

The rotary table with dividing head arrangement permits accurate location of holes quickly and easily. The rigidity of the machine assures continued accuracy, and the convenient arrangement of all controls within easy reach of the operator saves time on all jobs. Extreme flexibility is found in the table and knee construction which permits wide range of table movement in two directions and the full range of feeds and speeds available.

Ideally suited to tool room or tool and die shop operation Fosdick Jig Borers are also being used successfully and economically on production work.

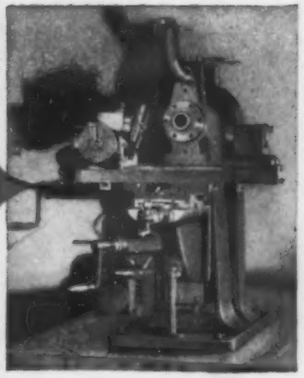
Built in three sizes. Fosdick Jig Borer Bulletin J.B.A. gives complete details of construction. *Write for yours today.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

Paired for PRECISION

◀ P&W BENCH LATHE

P&W BENCH MILLER ▶

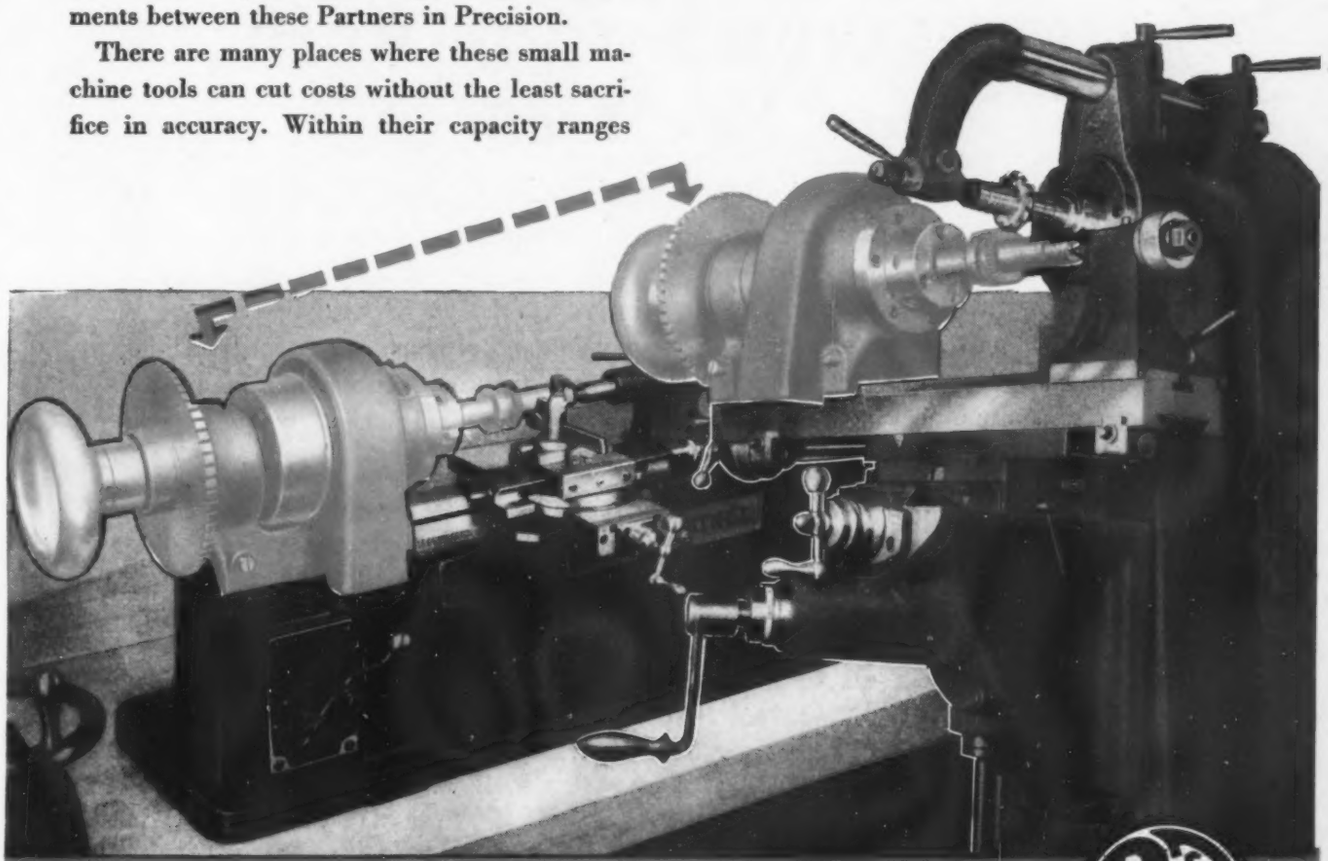


Shown below is an example of the precision possibilities of these P&W Bench Machines. After preliminary turning operations the entire Bench Lathe headstock was transferred to the Bench Miller *without disturbing the work setup.* Milling was completed and the job returned to the lathe for further turning and finishing.

Actually this transfer is a bit unusual except when extreme precision is demanded, but it shows the complete interchangeability of attachments between these Partners in Precision.

There are many places where these small machine tools can cut costs without the least sacrifice in accuracy. Within their capacity ranges and capabilities they are ideal in toolrooms, experimental departments and small parts production. They free larger machines for larger work—cost far less to install. A long list of attachments makes them extremely versatile—well worth investigating.

Write today for complete literature showing the P&W Bench Miller and two sizes of P&W Bench Lathes.



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ARMSTRONG

More ARMSTRONG TOOL HOLDERS for *More* Profit

Whenever you tool a new operation with the correct ARMSTRONG TOOL HOLDER, you increase your profit. Each has the extra efficiency resulting from over 50 years of continuous development and refinement in designs; the extra strength resulting from modern metallurgy and manufacturing methods.

With ARMSTRONG TOOL HOLDERS you can take advantage of the new high speeds and heavier feeds of the newer cutting materials, without revolutionary changes or costly experimentation. They are the most profitable tools obtainable; the lowest in initial cost, the longest in service and most economical in use, for all incorporate the basic Armstrong Principle of small interchangeable cutter-bits in permanent drop forged shanks. They are the most readily obtainable tools too, for they are stocked by all leading distributors.

With emergencies, restrictions and controls passing, now is the time to tool up for normal business with more ARMSTRONG TOOL HOLDERS, for more profit.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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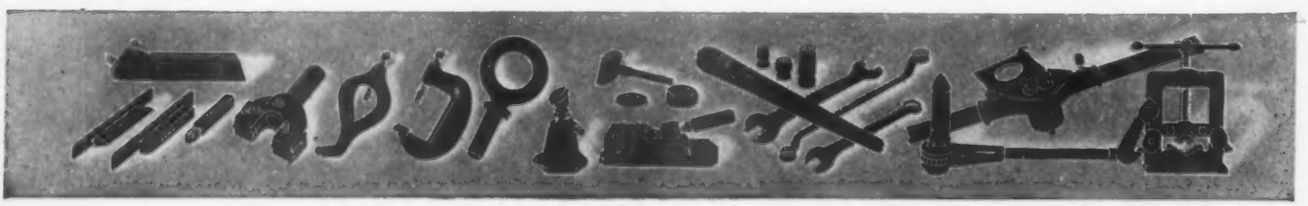
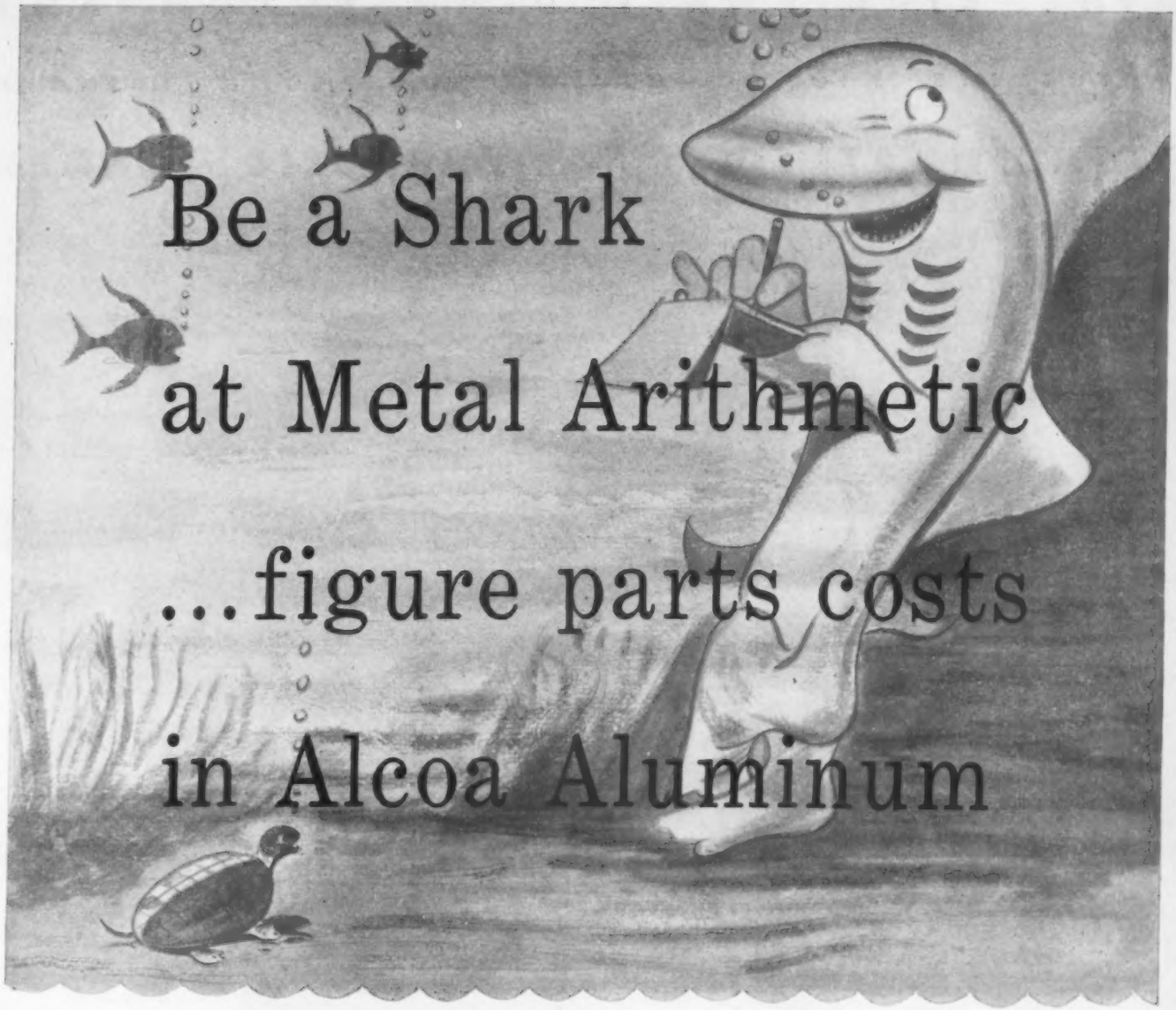
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, California





WHEN YOU ARE FIGURING COSTS PER THOUSAND PARTS:

Multiply the number of parts you'd get per pound of brass or steel by 3 . . . you get 3 times as many feet of stock per pound in Alcoa Aluminum.

Or, divide the per-pound cost of aluminum by 3.

Ask us about Alcoa 11S-T3, the alloy developed specially for use in automatic screw machines. You can cut it fast and deep and smooth. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

THE CINCINNATI PLANER COMPANY

presents the completely new and modern

CINCINNATI HYPRO HYDRAULIC PLANER

41 New and Exclusive Features

Double Housing or Openside Type

Sizes — 24"— 30"— 36"

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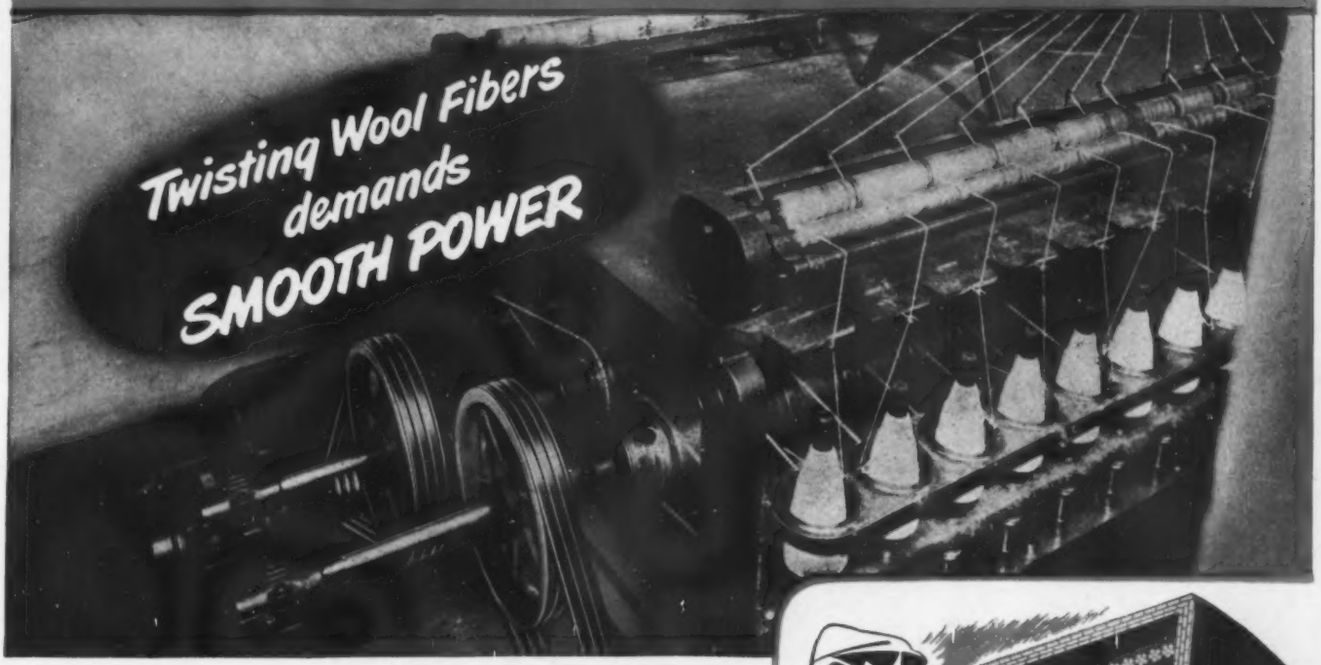
THE CINCINNATI HYPRO PLANER COMPANY

Cincinnati 9, Ohio

PLANERS • BORING MILLS • PLANER TYPE MILLERS

WHY DAYTON V-BELTS Start and Run Smoothly



Machines that twist wool fibers and run the yarn onto spools are delicate. Power drives must start and run smoothly or machines quickly get out of order. In the plant of a manufacturer of papermakers' felts, rough starting and stopping, plus the slipping of the original power drive on a twister machine, caused it to be out of operation frequently for hours at a time. Loss of production was serious. Then, five years ago, a Dayton V-Belt Drive was installed. Since then the twister has not been out of service once due to power drive failures.

Dayton V-Belts start, run and stop smoothly because they wedge themselves in the pulley groove, thereby absorbing the shocks of suddenly applied power when motors are started or when peak loads suddenly come on. Smooth starting is one of many reasons why Dayton V-Belts can help you solve your power transmission drive problems efficiently and economically. Your Dayton Distributor will gladly help you. Call him today.

DAYTON RUBBER • DAYTON, OHIO

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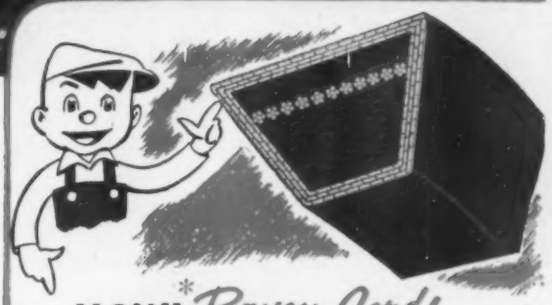

NOW! *Rayon Cords

PROVIDE DAYTON V-BELTS WITH

1. **MINIMUM STRETCH**
2. **GREATER FLEX STRENGTH**
3. **LONGER V-BELT LIFE**

*Rayon cords are specially processed by Dayton for use in V-Belts to provide the most efficient and economical power transmission service for your needs. For the complete story, write for booklet A-469.

A leading mill supply house near you stocks Dayton V-Belts . .
Look for the name in the yellow pages of your telephone directory

Dayton Rubber

THE MARK OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

T-J CUTTERS

for top speed work in tough die steels

Do your cutting in tough die steels—at *high speed*—with T-J Die Sinking Milling Cutters! Designed and built *right* for sturdiness...ability to hold a sharp edge longer...and carry less breakage percentage. *More work between grinds!* Made from a standard, extremely high grade steel . . . *better performance* because of extra strength, wear resistance and uniformity. Backed by 29 years of T-J experience. Write for catalog. The Tomkins-Johnson Company, Jackson, Michigan.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS

May I Count You In?

0-0-0-0
Veeder-Root Hand Tally counts up to 10,000—then resets to zero with turn of knob. Registers one count each time you press thumb-lever on top. Ring fits over finger. Case fits snugly in your hand.

You're sure to click with this headwaiter—because he clicks you in with a Veeder-Root Hand Tally. Why so? Well, that handy little gadget helps him to keep the club's capacity within the local laws, to anticipate table-vacancies, to keep tabs on waiters . . . and to keep tabs on *you!* All very simple and unobtrusive. And *very* good business.

This compact Hand Tally is one of scores of standard Veeder-Root Counting Devices (manually, mechanically, and electrically operated) which are used to keep count of everything from people and packages to the revolutions of a lathe. Then, too, there are any number of *special* Veeder-Root Devices which do such things as indicate the computed price and gallonage of the gasoline you buy. In fact there's a slogan: "Veeder-Root Counts Everything on Earth." Why not let Veeder-Root engineers show you how you, your product or your production machines can count to greater advantage? Write.

VEEDER-ROOT INC.

HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3.
In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.

Single and Two Point CLEVELAND Double Action Toggle

SINGLE POINT

Stroke of Slide	28"	Blankholder	26"
Adjustment	6"	Blankholder	6"
Area	40" x 40"	Blankholder	60" x 52"
Capacity	500 tons	Blankholder	300 tons

TWO POINT

Stroke of Slide	28"	Blankholder	26"
Adjustment of Slide	6"	Blankholder	6"
Area	40" x 89"	Blankholder	60" x 101"
Capacity	500 tons	Blankholder	300 tons

The power, accuracy, efficiency and economy of operation of Cleveland Single Point and Two Point Double Action Toggle Presses make them especially desirable for the Automotive, Electrical, Household appliances, Airplane and other similar industries which are required to produce a variety of pressed metal parts of widely different shapes and sizes.

Designed along the same general lines as our Modern Single Action Presses, and embodying all of the features which have found wide acceptance in the pressed metal industries, these Modern Cleveland Double Action Presses have the gears, flywheel and drive unit enclosed in the box type crown, a feature which not only eliminates all overhanging projections but also contributes to the rigidity of the Press and reduces floor space to a minimum.

If you are interested in Modern Presses for Modern production, it will pay you to consult Cleveland.

The CLEVELAND PUNCH & SHEAR WORKS COMPANY. . Cleveland 14, Ohio

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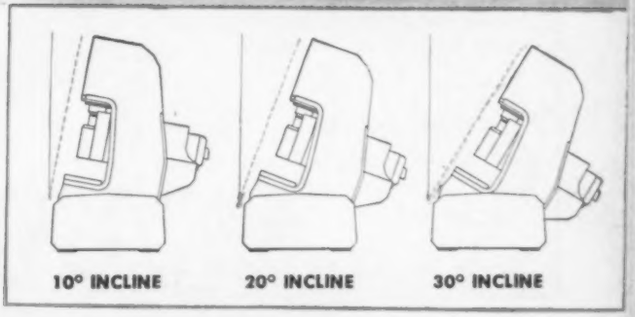
NOW.. THE *Economy* PRESS

WORLD'S *First* HIGH SPEED, *Inclinable* HYDRAULIC PRESS!

We've done it! Now . . . for the first time in history . . . there's a high-speed, inclinable hydraulic press! It's fast! It's H-P-M's ECONOMY PRESS! It's fool-proof! None of the mechanical limitations that cause costly, time-consuming delays!

Check these money-making features that slash operating costs. They're all built into the new H-P-M ECONOMY PRESS:

- √ Up to 100 Strokes per Minute
- √ Pressures up to 50 Tons
- √ Fool-Proof Operation
- √ No Clutch, Crank or Toggles
- √ Adjustable Ram Speeds
- √ Positive Overload Protection
- √ Straight Motion—No Side Thrust
- √ Automatic or Semi-Automatic Control
- √ Instantaneous Cycle Start
- √ Precision Inching Control
- √ Constant Work Stroke Speed
- √ Steady Squeeze—No Impact
- √ Low Horsepower Requirements
- √ Hydraulic Tilting Control
- √ Effortless Operation
- √ Versatile Application
- √ Fewer Rejects
- √ Simplified Design
- √ Welded, Stress-Relieved Steel Frame



Want to know more? Of course you do! Write for H-P-M's new Economy Press Bulletin or call in an H-P-M representative today.

HPM

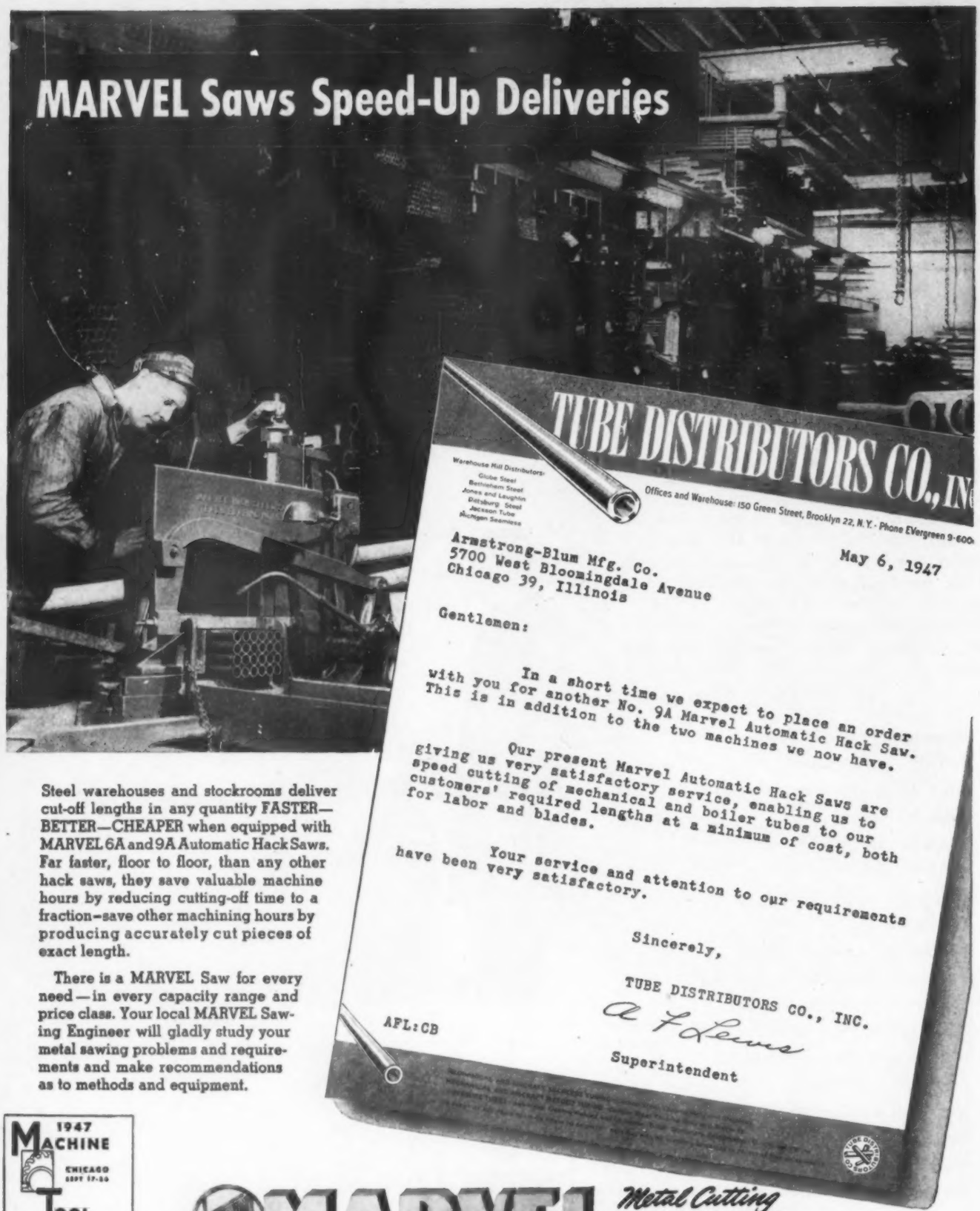
Branch Offices in New York, Philadelphia, Cincinnati, Cleveland, Columbus, O., Detroit, Pittsburgh, Chicago. Representatives in other principal cities

THE HYDRAULIC PRESS MFG. COMPANY

MOUNT GILEAD, OHIO, U.S.A.

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

MARVEL Saws Speed-Up Deliveries


TUBE DISTRIBUTORS CO., IN
Warehouse Mill Distributors:
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Offices and Warehouse: 150 Green Street, Brooklyn 22, N.Y. - Phone EVergreen 9-600
Armstrong-Blum Mfg. Co.
5700 West Bloomingdale Avenue
Chicago 39, Illinois
May 6, 1947
Gentlemen:
In a short time we expect to place an order with you for another No. 9A Marvel Automatic Hack Saw. This is in addition to the two machines we now have.
Our present Marvel Automatic Hack Saws are giving us very satisfactory service, enabling us to speed cutting of mechanical and boiler tubes to our customers' required lengths at a minimum of cost, both for labor and blades.
Your service and attention to our requirements have been very satisfactory.
Sincerely,
TUBE DISTRIBUTORS CO., INC.
A F Lewis
AFL:CB
Superintendent

Steel warehouses and stockrooms deliver cut-off lengths in any quantity FASTER—BETTER—CHEAPER when equipped with MARVEL 6A and 9A Automatic Hack Saws. Far faster, floor to floor, than any other hack saws, they save valuable machine hours by reducing cutting-off time to a fraction—save other machining hours by producing accurately cut pieces of exact length.

There is a MARVEL Saw for every need—in every capacity range and price class. Your local MARVEL Sawing Engineer will gladly study your metal sawing problems and requirements and make recommendations as to methods and equipment.

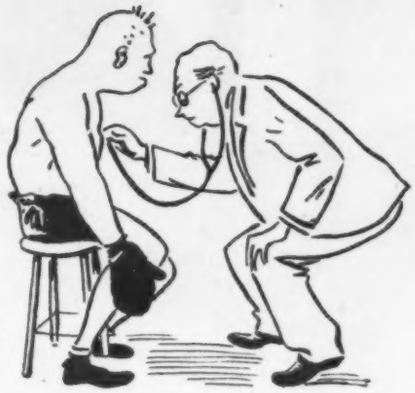
1947 MACHINE TOOL SHOW CHICAGO SEPT 17-26

Metal Cutting
MARVEL SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. COMPANY
"The Hack Saw People"
5700 BLOOMINGDALE AVENUE CHICAGO 39, U. S. A.

CHECK VIBRATION... to get longer product life

Now you can safeguard the durability of your materials and equipment by checking vibration quickly and easily with these G-E instruments. As you know, excessive vibration not only causes mounting problems, wear and tear on your equipment, but also cuts down worker efficiency due to disturbing noise. Tests for vibration, before your product leaves the factory and at periodic intervals, help you to eliminate these hazards and so increase the life of your product. If you have a problem dealing with vibration measurement, we'll be glad to help you work out a solution.



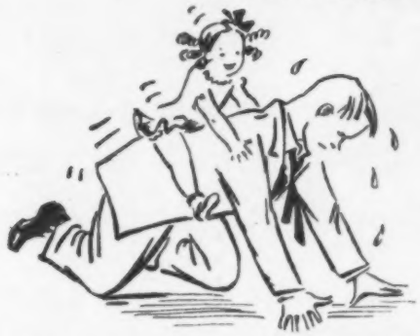
CHECK UP

TO KEEP FIT!

For general use, the *dial-type vibration indicator* gives you easy-to-read and quick results. It is simple to operate. The full-view dial is well depressed into the case for maximum protection. Covering a displacement range of 0 to 100 mils at 10 to 60 cycles per second, it's only 3½ inches in diameter.

For more accurate readings and over a wider range than the dial-type, the *light-beam type vibration indicator* can fill your requirements. It uses a light beam to obtain a line which shows the amount of vibration. Portable—weighs about 3½ pounds—and convenient. It covers a displacement range of 0 to 30 mils with 0.6 mil accuracy.

HOW MUCH FATIGUE CAN IT STAND?



The *pneumatic fatigue tester* determines the number of stress reversals a part can stand—6 to 10 times faster than conventional testing equipment. It handles a number of odd shapes as well as standard specimens. It's adaptable to high-temperature testing. Designed for samples with resonant frequency between 150 and 250 cycles per second. The only moving part is the specimen or sample.

MEASURES VIBRATION AT SUPERCHARGER SPEEDS

For h-f production testing of products like superchargers, high speed tools, air and gas turbines, the *h-f vibration meter* measures velocity and displacement. It is portable. Gives direct readings. With a range of 150 to 1000 cycles per second, this equipment can thoroughly check the significant vibrations which occur at rotation speed.

FREE INFORMATION BULLETINS!

Would you like to know more about the operation and application of these vibration testing equipments? Send for the bulletin you're interested in NOW!

- ☐ Vibration Indicators GEA-4140
- ☐ Fatigue Tester GEA-4652
- ☐ H-f Vibration Meter GEA-4361

Apparatus Dept., Section D800-35
General Electric Co., Schenectady 5, N.Y.

Name .....

Company .....

Address .....

City ..... State .....

GENERAL ELECTRIC

HALLOWELL

SHOP EQUIPMENT OF STEEL

Fig. 732
Pat. & Pats. Pending
Drawer is extra

SAVE YOURSELF THE TROUBLE AND EXPENSE OF
DESIGNING AND CONSTRUCTING YOUR OWN WORK BENCH

specify HALLOWELL READY-MADE WORK-BENCHES OF STEEL

To thousands of users all over the country, the famous "Hallowell" Line signifies ready-made Shop Equipment of sturdy, steel construction, good design, years of wear and utility, attractive prices and the ability to meet practically every plant or shop requirement.

These exceptionally strong, sturdy "Hallowell" Work Benches of Steel are designed to stand firm and rigid without costly bolting to the floor; and to withstand constant use and abuse. They have interchangeable sections . . . are made in five heights and widths and in seven standard lengths which can be moved easily and joined end to end to form a continuous work-bench of any length. More than 1300 combinations make it almost certain that you will find exactly the right bench for your requirements.

For complete information about "Hallowell" ***ready-made*** Work-Benches of Steel and the many other products in the "Hallowell" Line of Shop Equipment of Steel, write for the "Hallowell" Catalog.

"Unbrako" and "Hallowell" Products are sold entirely through Industrial Distributors

Fig. 1734

Over 44 Years in Business

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX [illegible] · BRANCHES: BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

Check These Advantages of CLEVELAND HIGH SPEED COUNTERBORES AND SPOT FACERS

RIGID AND STRONG

The counterbore and spot facer being integral with the shank and the shank being a standard taper, permits the tool to be used directly in the machine spindle, eliminating all holders and adapters.

SIMPLE IN DESIGN

Made of the best grade of High Speed Steel, with no unnecessary or easily mislaid parts.

EXTRA LONG FLUTES

The flutes are extra long, which gives extended life for regrinding and permits the counterboring and spot facing of parts which cannot be reached with a short tool.

TOOL STEEL PILOTS

Pilots are made of the best grade of Carbon Tool Steel, properly heat-treated and ground. They are simple in design, having a straight shank with a flat for the set screw.

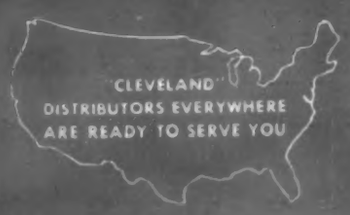
Telephone your

INDUSTRIAL SUPPLY DISTRIBUTOR

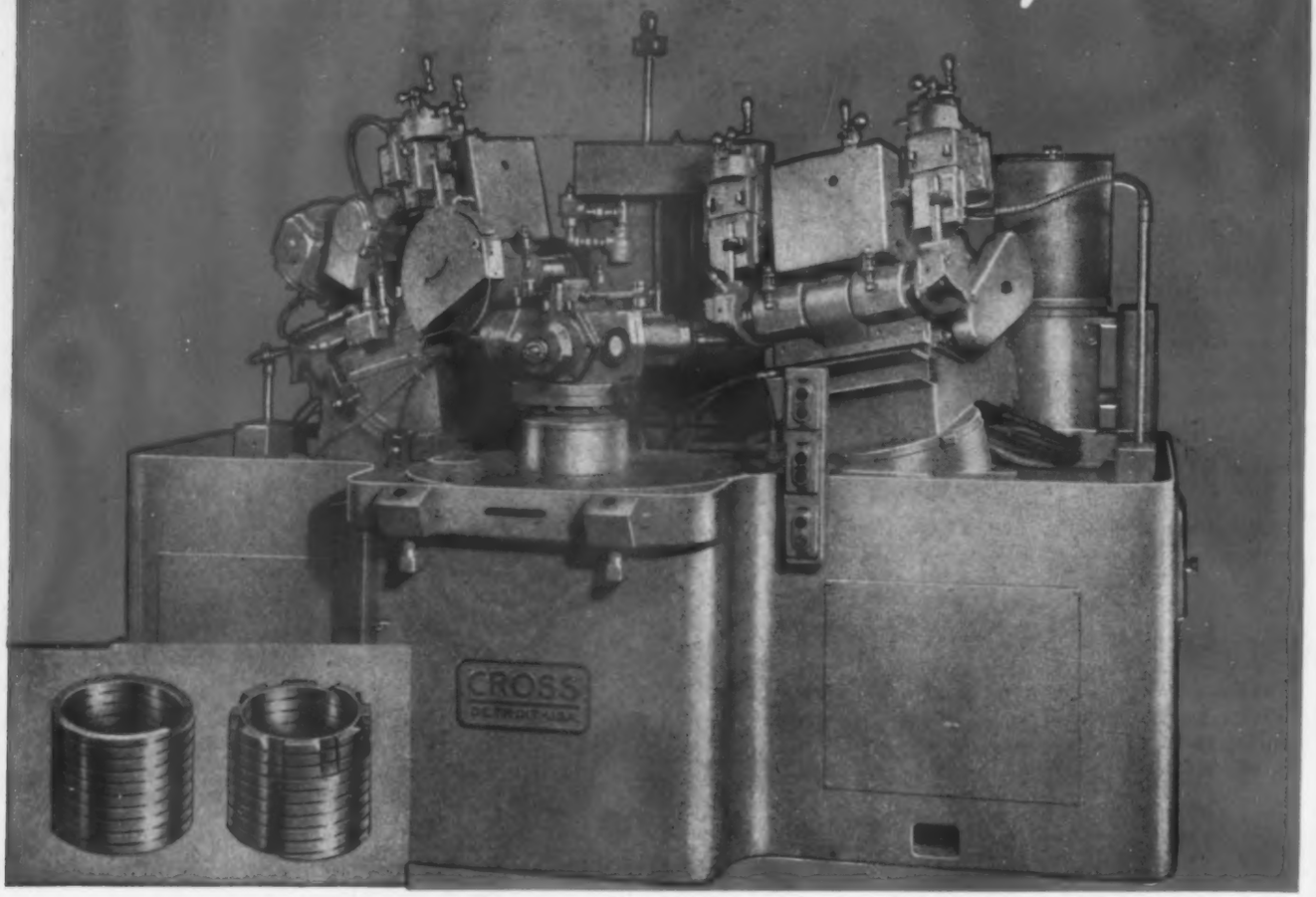
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

70 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 658 HOWARD ST., SAN FRANCISCO 5
2929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W. 3, ENGLAND



Another Special Machine by Cross



Productivity Per Man-Hour Boosted 466%

Cross machine tools take over operator tasks—eliminate man-hours—make men more productive . . . thereby ***Reducing Direct Labor Cost*** and increasing profit.

Three Cross special 3-station Double Index Grinding Machines as shown above, with ***3 Unskilled Operators, Replaced 17 Machines and 17 Operators.*** Results—466% greater productivity—lower direct labor cost—increased profit.

The typical example explained here is one of many parts which are being produced economically on this machine.

PART: Spring Clutches.

OPERATIONS: Grinding eight 1/8" slots, 1/16" deep and chamfering one side 45 degrees; from the solid.

PRODUCTION: 200 parts hourly (3200 operations) per machine.

OUTSTANDING FEATURES: *Completely automatic cycle operation,* including automatic wheel dressing. Flexibility for grinding from 6 to 24 equally spaced slots of various widths, lengths and angles in a wide assortment of spring clutches.

Parts are indexed automatically about their own center, as both wheels reciprocate in timed relationship to form slots at first station, while chamfering at second station.

Operator loads while grinding takes place. For safety, he must push a button with each hand before station indexing.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE CROSS COMPANY

Established 1898

©1947—THE CROSS COMPANY

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

NIAGARA *announces*

a new ELECTRONIC AUTOMATIC WELDING *machine*

The advantages of mechanized Automatic Welding are illustrated in Bulletin 83. Write for your copy.

• One man operation, faster welding, less passes per seam, stronger and better quality welds at lower labor costs are made possible by this new Niagara Electronic Automatic Welding Machine.

Electronic control provides variable speed of the machine along a track so that the length of welding is governed only by the track length. Welds perpendicular to the track are accomplished by traveling the welding head at a variable speed along the cantilever beam. Centralized fingertip, push button control quickly brings the power elevated beam to any height position thereby providing maximum speed in changing from one setup to the next whether the job be a long slender member or a massive frame.

NIAGARA MACHINE AND TOOL WORKS

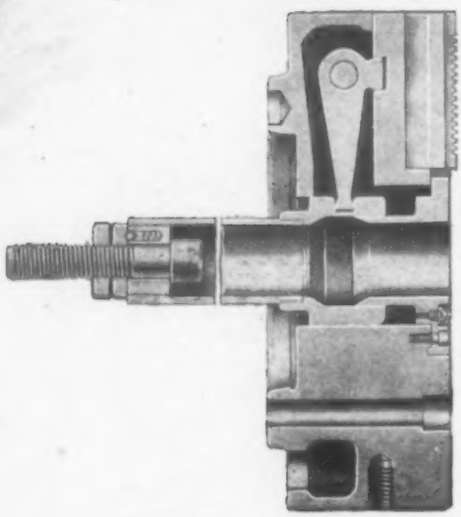
District Offices: CLEVELAND • NEW YORK • DETROIT

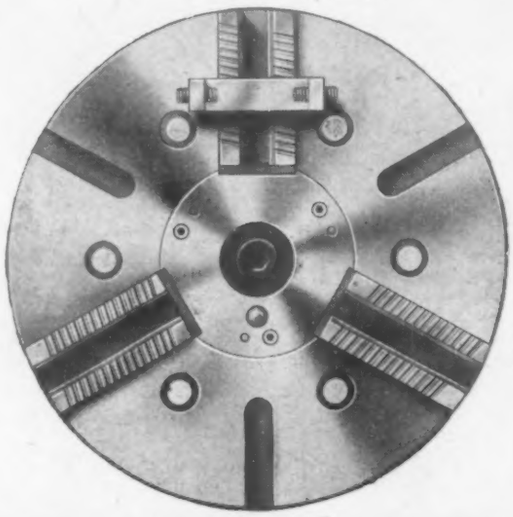
637-697 NORTHLAND AVE., BUFFALO 11, N. Y.

CUSHMAN *Announces*

A COMPLETE NEW SERIES OF AIR POWER OPERATED CHUCKS *and* DEVICES

...developed to aid the Metal Working industries in increasing production and reducing Production Costs





1947 MACHINE TOOL SHOW
CHICAGO SEPT 17-26

BOOTH 271

WITH THESE TIMELY FEATURES

● **New "Accralock" precision jaw adjustment feature** on adjustable serrated jaw chucks provides most precise and positive method yet devised for this important adjustment.

● **New one-piece, light weight steel chuck bodies,** with weight correctly distributed to assure rigidity and maintained accuracy while reducing flywheel effect in high speed operation.

● **New simplicity in design,** with all working parts enclosed and effectively sealed against entry of dirt or chips.

● **New PRECISION in construction** and close tolerance fit of all parts. Chuck bodies accurately balanced.

● **New more rugged operating mechanisms** with wearing parts of correctly selected and hardened alloy steels.

A comprehensive series of chucks in adjustable serrated jaw . . . manufacturing . . . screw adjustable . . . and compensating jaw styles. Also 2-jaw round body and gib type chucks and collet chucks.

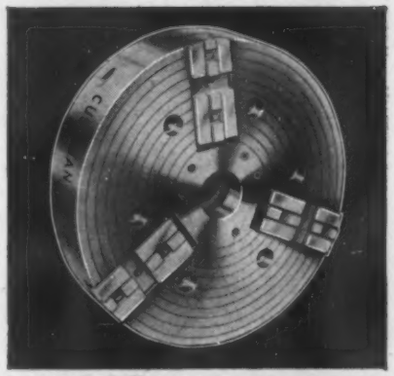
Furnished with both straight recess and American Standard tapered recess mountings. American Standard jaws and top jaws.

Newly designed rotating air cylinders and air control equipment developed to assure a "balanced" power system. Easily installed, compact and efficient, greatly reduced maintenance.

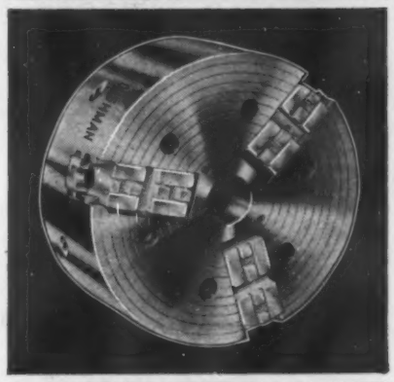
A comprehensive series of stationary air cylinders widely adaptable to shop and machine tool applications calling for powerful, dependable units with precision control.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Conn.

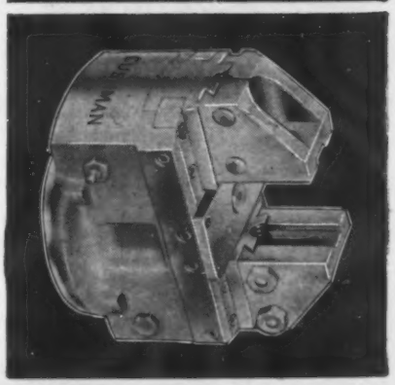
Series 5238A-1 "Accralock" Chuck



Series 5236A-1 Manufacturing Chuck



Series 8236A-1 Screw Adjustable Chuck



Series 4026 2-Jaw Gib Type Chuck

From out of the scrap pile

Chips from an "Automatic", like that below, imbedded in a Bakelite block for microscopic study and grain hardness measurement.

comes better

MACHINABILITY

● To most people, steel chips from an automatic screw machine are just so much scrap—useful only as part of a furnace charge in making new steel bars.

Not, however, to the metallurgists in Republic's Union Drawn Steel Division laboratories. To them, steel chips tell an important story—provide a valuable source of information about the machining characteristics of steels.

Chip samples are selected at regular intervals for studying changes that occur in the steel during machining—right down to Knoop Hardness readings of individual grains in the chips.

That's because MACHINABILITY takes precedence over everything else at Union Drawn—and extreme care constantly is exercised throughout laboratory and mill practices to make sure that nothing is overlooked which might help to improve this property. Also, Union Drawn engineers spend long hours studying the performance of various steels under actual production conditions in customers' plants.

And that's why Republic Union Cold Drawn Steels:

1. **Enjoy top ratings on speeds and feeds.**
2. **Are highly uniform in machinability.**
3. **Produce smooth, bright machined surfaces.**
4. **Are remarkably free from abrasive elements.**
5. **Reduce wear on tools—save grindings.**
6. **Help increase production efficiency.**
7. **Make possible greater output—lower cost.**

To further improve MACHINABILITY, Union Drawn also offers all modern forms of furnace treatment—annealing, normalizing, spheroidizing, stress relieving and other heat treatment.

Right NOW is the time to learn what this better MACHINABILITY can do for you. Write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Republic

REPUBLIC STEEL REG. U. S. PAT. OFF.

UNION COLD DRAWN STEELS

REG. U. S. PAT. OFF.

Free-Machining Bessemer, Alloy and Enduro Stainless Steels

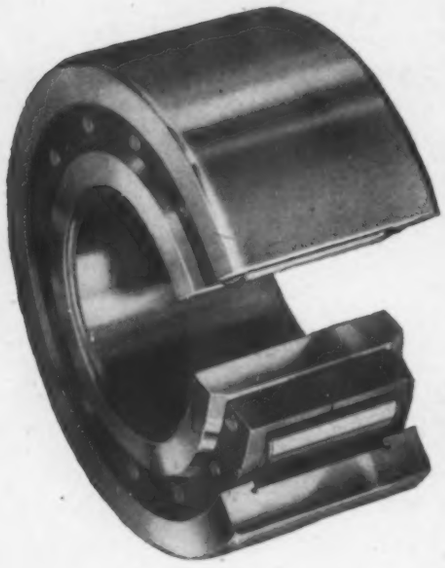
•

Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

REDUCE SHUT-DOWNS *with* ROLLWAY Right-Angle Loading



Cut Maintenance Costs
Get Longer Bearing Life

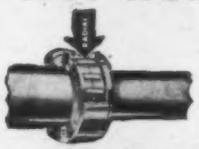
Right-Angle Loading splits compound loads into the two component parts of pure radial and pure thrust . . . and carries each of these components on separate bearing assemblies.

ROLLWAY
RIGHT-ANGLE-LOADED
BEARINGS

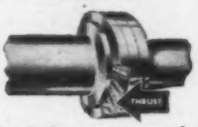
WHAT THEY DO

Prevent wedging of rollers and pinch-out ● Reduce roller end-rub, with its wearing friction ● Hold starting and operating torque at a minimum ● Eliminate complicated stresses ● Since only pure radial or pure thrust loads can be imposed on any single bearing assembly, unit pressures are substantially reduced ● Since all loads are carried at right angles to the roller surface, compound or oblique loads are avoided, and so are the resultants of the oblique loads ● Right-angle loading permits Rollway Bearings to carry greater radial or thrust load capacity in any given dimension ● Right-angle loading assures solid cylindrical rollers of greater roller mass and uniform roller cross-section . . . greater resistance to shock loads and vibration . . . longer life expectancy under continuous heavy-duty service.

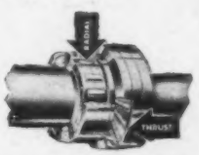
HOW THEY WORK



When it's pure radial load, the load bears at a right angle to the rollers.



When the load is pure thrust, it bears at a right angle to the rollers.



When radial and thrust are combined, the two loads are resolved separately at a right angle to the rollers.

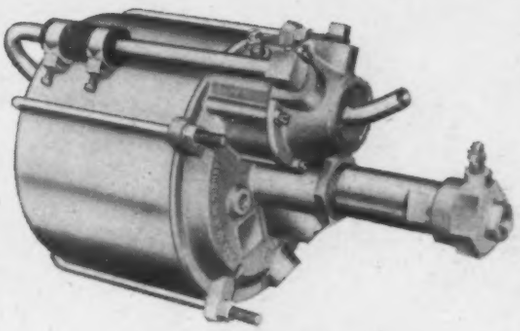
FREE SERVICE / Get the RIGHT Bearings for Your Particular Needs. Rollway Engineers will gladly make necessary calculations, drawings and supply other required information for a complete understanding of your bearing needs. Strictly confidential. No charge, of course.

ROLLWAY BEARINGS

ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Cleveland • Detroit • Chicago • Minneapolis • Houston • Los Angeles

Bendix HYDROVAC 1ST IN POWER-BRAKING



precision machined on SOUTH BEND LATHES

The Bendix Hydrovac power braking unit, proved by more than a million installations and billions of miles of service, is one of many outstanding technical achievements by Bendix Aviation Corporation which played important roles with our fighting forces and are now contributing to peace-time enterprise. Hundreds of South Bend Lathes are used by Bendix Aviation Corporation in their experimental laboratories, toolrooms, and manufacturing departments for the development and production of their products.

At left: Technician Henry Janowski, Experimental Department, Bendix Products Division of Bendix Aviation Corporation, using a 16-inch swing South Bend Precision Toolroom Lathe to machine the end plate for an experimental Bendix Hydrovac.

SOUTH BEND LATHES

South Bend Precision Engine Lathes and Toolroom Lathes are made in five sizes — with 9", 10", 13", 14½", and 16" swings. Precision Turret Lathes are made in two sizes: Series 900 with ½" maximum collet capacity and Series 1000 with 1" maximum collet capacity. Please state size and type of lathe when requesting catalog.

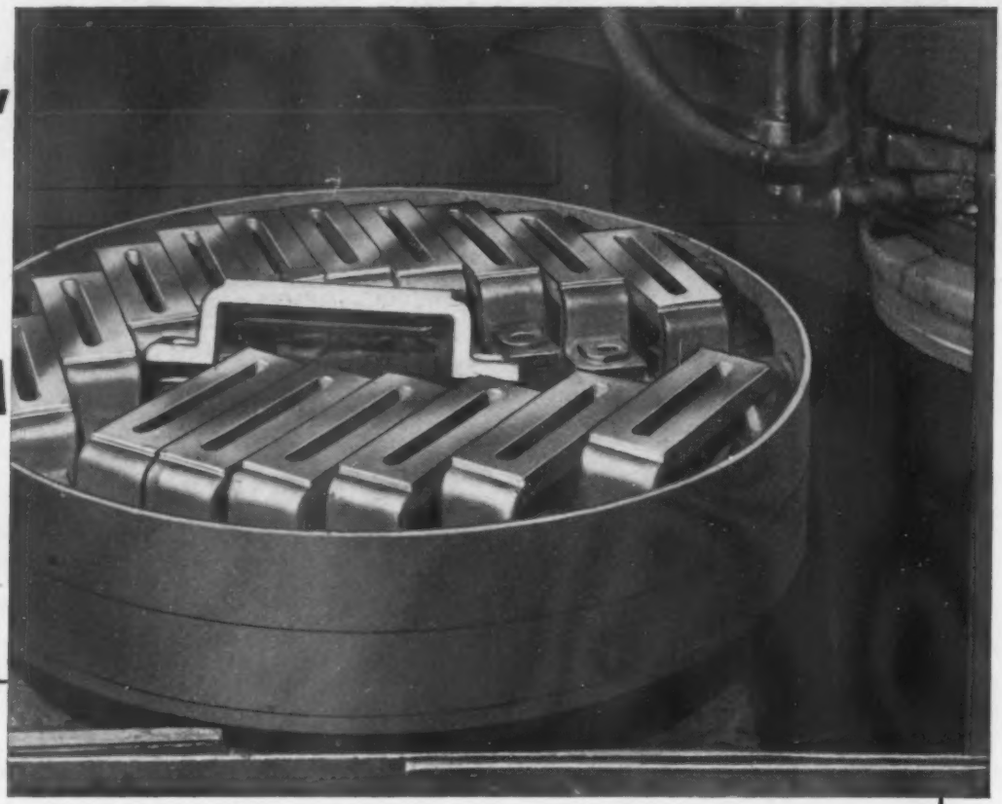
LATHE BUILDERS SINCE 1906

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET
SOUTH BEND 22, INDIANA

6 REASONS WHY A BLANCHARD

"HOGGED" THIS JOB AWAY FROM A PLANER



THE JOB...

● The illustration shows 17 doffer drawing pulley brackets being held on a 36-inch chuck of a No. 18 Blanchard Surface Grinder. Material is cast iron. Rough size $15\frac{3}{8}''$ x $3\frac{1}{2}''$ x $3\frac{3}{4}''$. Two sides—the top and the feet—are ground, in two operations, to make the height $3\frac{7}{16}''$. Commercial finish required.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1. **Greater PRODUCTION:** Previously planed in 43.8 minutes each. *Now Blanchard-Ground in 5.4 minutes each, or in* $\frac{1}{8}$ of the time previously required.
2. **Saved a FIXTURE:** Blanchard Grinding eliminates the use of a holding fixture previously necessary.
3. **Saved MATERIAL:** Blanchard Grinding permits less allowance for finish, and saves many pieces that would otherwise have been "salvage".
4. **Greater FLATNESS:**
5. **Finer FINISH:**
6. **Closer LIMITS:**

These are so effortlessly produced by Blanchard Grinding that—on jobs such as illustrated—you get all three of them as "by-products" from the use of:

THE MOST EFFICIENT METHOD OF PRODUCING FLAT SURFACES

Whether your grinding requires hogging cuts or light finish cuts, fine finish and/or extreme accuracy, avail yourself of Blanchard *Free Consultation Service.* Another Blanchard Service is *Sample Grinding* on which you pay only the transportation charges.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Here's something NEW... in metal cutting

the WELLS No. 12 horizontal Band Saw with...

Automatic Cutting Cycle

and

Controlled Blade Pressure

HERE it is—the new Wells No. 12 Metal Cutting Band Saw with controlled, automatic cutting that reduces operator fatigue, makes better cuts and lengthens blade life. With the new Wells No. 12, just place the stock—bars, rounds, sections or pipe—in the quick-acting vise and push the starting buttons—the machine does the rest. The head comes down automatically, feeding the blade into the stock at a controlled pressure. At the completion of the cut, the head is raised hydraulically to a predetermined position and the motors shut off. Write for complete details and literature.

DESIGN DETAILS

- Heavy duty—suitable for production or general utility.
- Blade is in horizontal position at all times.
- Hydraulic controls for head motion.
- Blade pressure controlled by sensitive micro-switch and solenoid.
- Capacity: rectangular 12" x 16"; rounds, 12" Dia.
- Blade: 1" x .035" x 13' 7"
- Speeds: selective, 50, 90 or 150 ft. per min.
- Motors: ¾ H.P. blade motor, ⅓ H.P. hydraulic system motor.
- Weight: approximately 1750 lbs.

Wells SAWS

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICH.

6 FISTFULS

OF LONG, RUGGED DUTY in GLOVES, MITTENS, PADS

Steel staple stitching at points of wear and tear make these AO Gloves, Mittens and Pads of chrome-tanned cowhide a sound investment in materials handling. They are flexible and comfortable to wear while protecting hands from rough stock. These highly serviceable products are part of a complete line of AO steel-stapled gloves and hand pads designed for specific jobs. Your nearest AO Safety Representative can supply you.

AO 1644 GLOVE—Extended glove life is due to steel-stapling of palm and fingers over reinforcing leather strips and steel-stapled leather patch on thumb. Also all seams on face of glove steel sewed. 4" gauntlet. For handling heavy castings, rough scrap in foundries, steel mills.

AO 1674 REVERSIBLE MITTEN—Double the wear because it may be worn on either hand. All seams *steel* sewed—to provide the strength to withstand the rough steel stock this hard-working mitten handles.

AO 1201 HAND PAD—Open back—fully protected thumb. Like the glove and mitten, the hand pad is made of top grade chrome-tanned cowhide. Reinforced with leather palm patch steel-stapled to palm.

Safety Division

American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

ACCURACY *pays off!*

ACCURACY pays off in metal working shops, too. And that's ONE reason so many plants have switched to Cimcool. This new kind of cutting fluid — this *chemical emulsion* promotes accuracy three ways: **1.** With Cimcool, work, chips and tools actually remain cool to the touch. It maintains uniform temperature of work and machine. **2.** Freer cutting, due to Cimcool's chemical lubricity, reduces pressure. **3.** Dirt does not stick to work, permitting faster, more accurate gaging. — *May we show you "evidence"?*

BUT ACCURACY ISN'T ALL YOU GET!

- Faster cooling allows faster cutting.
- Chemical lubricity increases tool life.
- No fire hazard—No smoke—No slippery film.
- Non-irritating—not subject to rancidity.
- Contains long-lasting rust inhibitor.
- Covers 85% of all metal working jobs.

CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

Black & Decker Sanders Speed Up Many Surfacing Jobs

Speeds Wire Brushing—With "Whirlwind"* Wire Cup Brushes, the Sander takes off old paint, rust, scale . . . cleans castings, tanks, boilers, vats, sheet metal and soldered joints.

*Trade Mark Reg. U. S. Pat. Off.

Sands Any Surface—With abrasive discs, a Black & Decker Portable Electric Sander speeds up sanding of any surface from fast metal removal to satin-smooth finishing.

Grinds Any Metal—With saucer or cup-type grinding wheels, the Black & Decker Sander removes metal; smooths welds and casting ridges; grinds off old rivets, studs and bolts; sharpens stationary machine blades.

Planes and Gouges Wood—With rotary gouging and planing heads, it shapes and semi-finishes lumber, working faster than jack plane and adz . . . removes stencil and brand marks from barrels and boxes.

See Your Black & Decker Distributor for helpful information on Sanders, Grinders, Drills, Saws and many other Portable Electric Tools for production, construction, maintenance and repair. For your free copy of our complete catalog, write today to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Maryland.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

VIBRATION — It's hidden... in high costs

Control it with

LORD
SHEAR TYPE
Bonded Rubber
MOUNTINGS

Right now—this minute—and in your plant . . . *you're losing money.* The cause . . . VIBRATION! You can't see it—it's hidden . . . but you can see vibration's costly results on your profit and loss statement . . . in high costs—directly attributable to industrial fatigue, lagging production, inferior accuracy, excessive scrap and shortened machine life.

Vibration can be controlled . . . and doing that you can raise your plant efficiency and morale, your product quality, and your profits. For immediate action, contact the nearest Lord Field Engineer or Lord direct. Let him analyze your product . . . in countless cases efficient application of Lord Vibration Mounts has surprisingly improved product performance. And ask him to check factory equipment . . . possibly a relatively simple solution can eliminate vibration, making your plant a better place to work—and a better working plant.

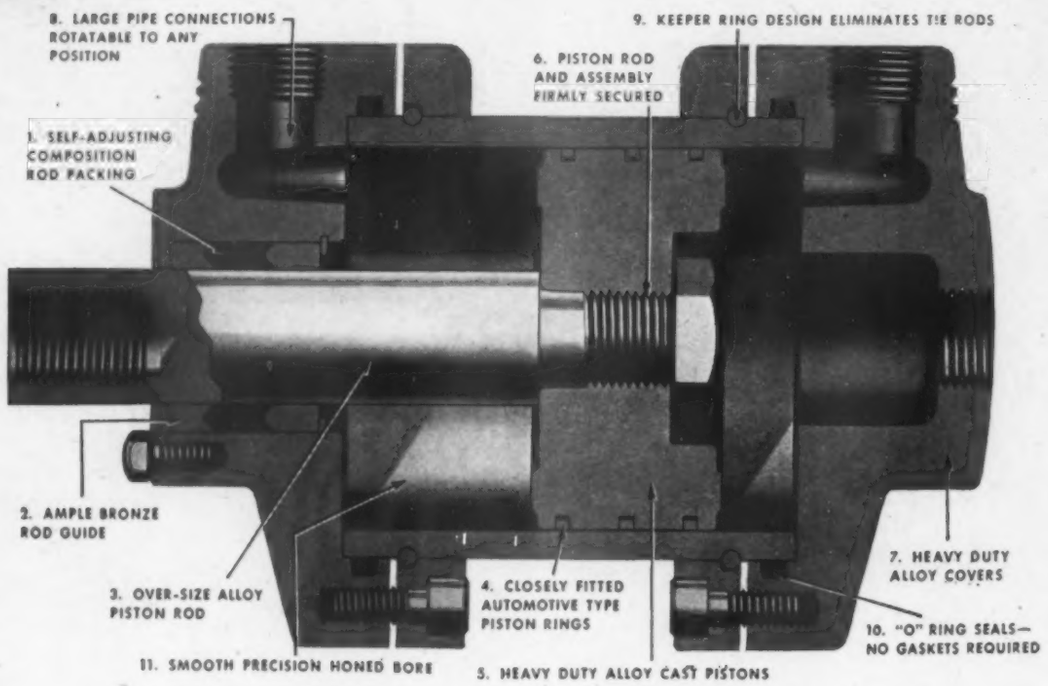
A quarter-century of scientific research and experience in the field of Vibration Control and Bonded Rubber Products backs up our recommendations. Put us to work on your problems . . . make Lord your Headquarters on Vibration Control.

LORD MANUFACTURING COMPANY ERIE, PA.

Sales offices { New York, N.Y. Providence, R.I. Washington, D.C. Detroit, Mich. Chicago, Ill. Burbank, Cal.
Canadian Representative: Railway & Power Engineering Corp., Ltd., Toronto, Canada

Designed for... noted for... superior performance!

GEROTOR HYDRAULIC CYLINDERS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9. KEEPER RING DESIGN ELIMINATES TIE RODS
6. PISTON ROD AND ASSEMBLY FIRMLY SECURED
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2. AMPLE BRONZE ROD GUIDE
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4. CLOSELY FITTED AUTOMOTIVE TYPE PISTON RINGS
7. HEAVY DUTY ALLOY COVERS
10. "O" RING SEALS— NO GASKETS REQUIRED
11. SMOOTH PRECISION HONED BORE
5. HEAVY DUTY ALLOY CAST PISTONS

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cylinders • valves
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8 SPINDLES . . .
32 TOOLS
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MODERN-MAGIC
CHUCK AND COLLET EQUIPMENT

The above set-up is a typical example of what can be done with MODERN Magic Quick Change Chuck and Collet equipment. Here, four spindles of the machine, equipped with MODERN Magic Chucks, perform twenty-eight separate operations.

The twenty-eight tools are easily and quickly changed without stopping or even slowing the machine. Bulletin M-101 gives complete details on MODERN Magic Quick Change Chuck and Collet equipment. Send for your copy today.

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Low-Cost Production BAND SAWS

WHAT YOU GET IN MODEL LHV FOR METAL, WOOD, PLASTICS

For both low- and high-speed work. Saw blade speeds in two ranges: 100 to 300 f.p.m. and 1700 to 5100 f.p.m., infinitely variable with Speedmaster variable drive. Enclosed hardened steel helical gear transmission. Speed indicator.

Throat depth, 16". Work thickness capacity, 12⅛". Table size, 20"x20"; 45° tilt to right and 5° to left; has miter-gage groove. Saw-blade wheels, 16" cast aluminum, balanced. Bearings, heavy-duty, ball-bearing type; no end play; have grease fittings. Adjustable saw guides with friction-resisting plastic inserts. Blade width capacity, 1/16" to ¾". Blades 122" long; durable, hard-tooth type, 5 assorted sizes furnished with each saw. Frame, die-formed plates arc-welded and adequately braced; exceptional strength and rigidity for permanent alignment; piano-type hinges; two doors. Floor space, 22½"x28½". Height, 66", 40" from floor to table. Color, vista green and buff. Motor required, ½ or ¾ hp.

MODEL HS-4—HIGH SPEEDS

Has same specifications as given above for model LHV except that Model HS-4 has blade speeds of 2000, 3000, 4000 and 5000 f.p.m. obtained by 4-step cone pulley. Blade width capacity from 1/16" to ⅝".

DETAILS OF OTHER MODELS FURNISHED ON APPLICATION

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Spot American Machinist's NEWS OF METALWORKING

Look for unions to seek elimination from contracts of no-strike clauses and other provisions calling for union responsibility. Reason: unions now can be sued for breach of contract and must assume responsibility for acts of their agents, whether authorized or not.

Some half dozen automatic transmissions for Ford, of both Ford and suppliers' design, are under scrutiny to remove "bugs." Certain machinery already completed for the purpose must be rebuilt when the final transmission design is approved. Ford has reached a new high in considering projects which will improve working conditions and lower costs. Vendors with good ideas are asked to call.

Replacement of 35,000 old machine tools in first five years and of 25,000 in final five years is provided for in proposed 10-year industrial rehabilitation plan in Belgium. The engineering industry would spend $275 million on this modernization program. Belgian metalworking industries operate 90,000 machine tools. Parliament has not yet approved the project.

Crystal-gazing note: lathe builder predicts time not far distant when blueprint or its equivalent can be put in a lathe, the tool set correctly in the start position, a button pressed to begin the machine cycle, and the part will be turned to the shape shown by the print.

Trading steel scrap for sheet steel and iron pipe is latest gray market practice. Some scrap dealers will not dispose of their scrap on any other basis. They then sell the pipe to the plumbing trade at a fat price over and above regular trade quotations.

British exported over $8 million of machine tools in first four months of '47, of which $2.6 million went to France and $2.7 million to India, South Africa and Australia. In same period Britain imported $3.8 million of machine tools from this country.

> **Half of wage settlements by automotive and aviation parts makers are for less than 15-cent pattern. Farther away a company is from Detroit, the smaller the increase. Few firms on periphery of the industry have not been approached. Some companies in Detroit have settled for 7-8 cents because they are unable to stand a 15-cent hike in rates.**

War Assets has moved number of production equipment items (many types of compressors, generators, motors, internal combustion engines, pumps, engine generator sets) from Clayton formula to so-called fixed prices which are much lower. It also has increased discount on surplus standard general-purpose machine tools to 17½% for rebuilders, manufacturers, exporters, dealers and other distributors who purchase for resale.

High production costs of one metalworking company are caused by unbalance of inventories. Plant is on two 40-hr. shifts, but is constantly having to run on Saturdays and sometimes use a third shift. Saturdays cost 1½-time for first five hours and double-time for next three. Third shift gets bonus for working at that time of day.

Labor phenomenon in midwestern plant: union asked management to fine any employee who went on strike, fine to be divided equally between company and union.

Veto power has been exercised recently by Department of Justice to block acquisition of three surplus government plants by company which is regarded as a monopoly.

Electric generators for automobiles are expected to be increased from today's 35 amp. to 60-85 amp. in next few years. Expanded capacity will be required to handle contemplated electric windshield wipers instead of vacuum, opening of hood by electric motor, raising and lowering of convertible tops by electric-driven hydraulic pumps, movement of windows and front seats electrically.

Automatic drilling, chamfering and tapping of refrigerator parts on—

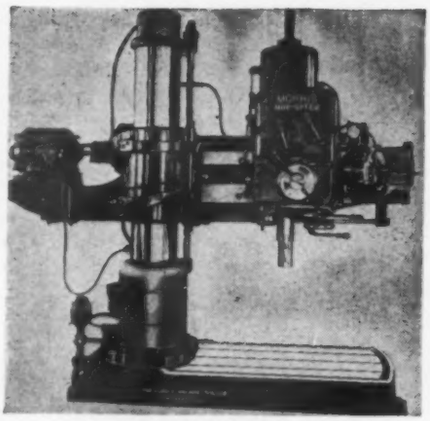
MORRIS
MOR-SPEED
THREE-WAY MACHINE

● The machine illustrated was designed—developed and built by Morris to handle the drilling — chamfering and tapping operations on bearing plates for a refrigerator manufacturer.

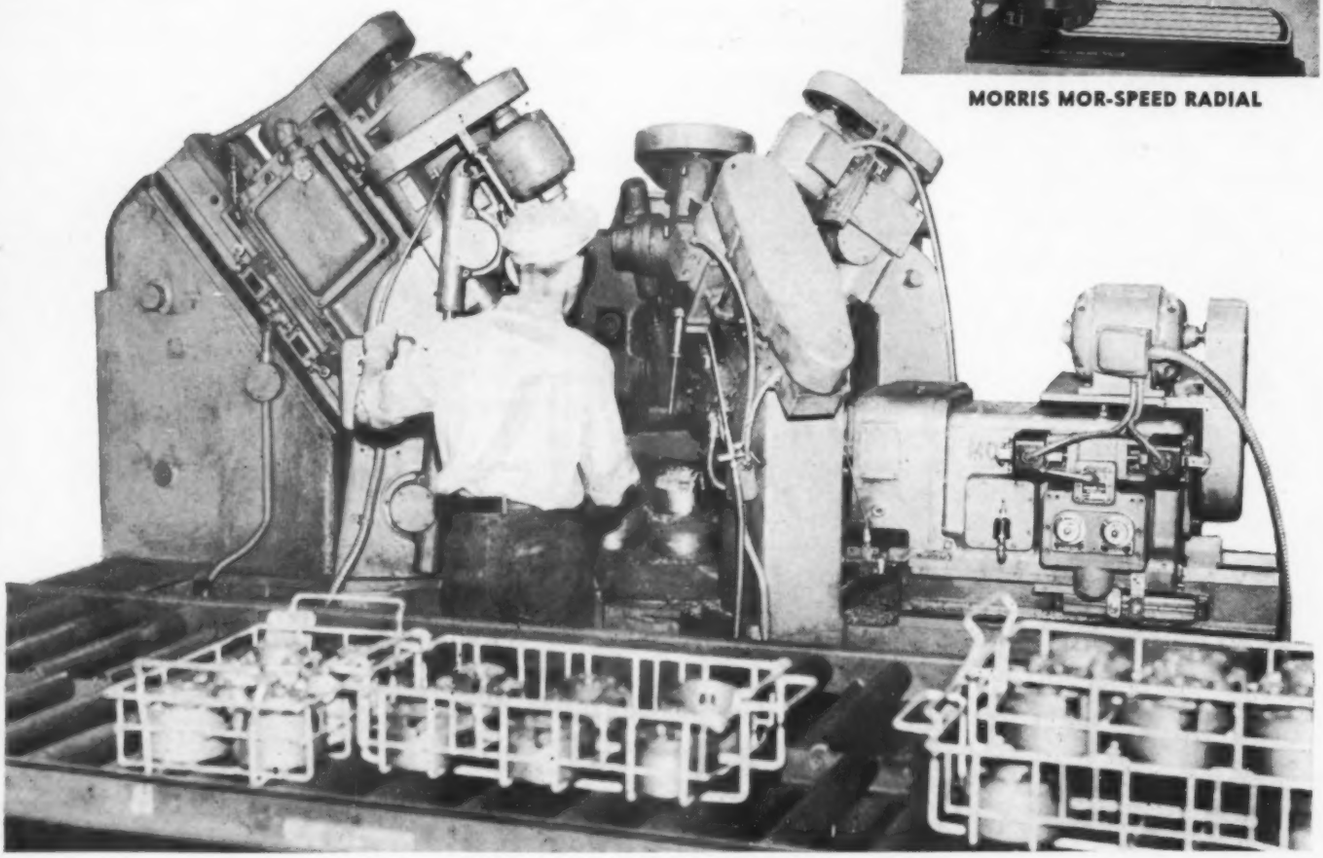
The machine has an eight station automatic indexing table and automatic indexing fixtures which carry the work. All the operator has to do is load and unload the work and manipulate the push button controls.

Independent hydraulic units carry the spindle heads consisting of 9 drill spindles and 1 tap spindle.

If you have a high production job requiring similar operations consult Morris—they have the engineering "know-how", experience and facilities to help you.



MORRIS MOR-SPEED RADIAL



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

H. R. 3670 Should Be Passed

Preservation of an ample supply of machine tools and other metalworking equipment for immediate use in a national emergency is imperative.

For some weeks teams from the Army, Navy, and Air Corps have been earmarking surplus machines for this purpose. Their objective is to put into a national reserve some 80,000 units.

But the Army and Navy Munitions Board, under which the teams operate, is severely handicapped in this program. There is no legal authority permitting transfer of surplus machines without reimbursement from the government agencies now holding them to a centralized national reserve.

The tagging of necessary machines has been proceeding anyway. The board has gone ahead with the hope that eventually it will be granted the requisite authority.

Meanwhile machines already earmarked for the reserve are being sold by War Assets Administration to ready industrial buyers. The reason is that WAA seemingly has no right to hold the machines back from buyers if the machines are needed for immediate production.

This unhealthy and dangerous situation demands quick action. The remedy lies in passage by the House of Representatives in Washington of H. R. 3670. A like measure should be introduced and passed in the Senate.

H. R. 3670 is called the "National Industrial Reserve Act of 1947." The bill provides a comprehensive and continuous program "for our future safety and for the defense of the United States."

It legalizes the present tagging of machines for a national reserve by the JANMAT teams and makes possible the transfer of machines to the armed services at no cost.

Its purpose is "to eliminate or reduce to the maximum extent possible, consistent with the needs of industry for peacetime production, the delays and bottlenecks experienced in World War II in converting from a peacetime production economy to one geared to the full prosecution of a global war."

The bill states that only surplus machines not in short supply are to be chosen. The reserve machines are to be adequately maintained; that portion of them no longer suitable for retention may be disposed of from time to time.

A review committee, consisting of 15 competent civilians, is to take a look at the situation at least once a year and see that the reserve is properly kept up and that the machines no longer essential are released.

Up to now we have been dissipating our defense assets at an alarming and devastating rate. In our anxiety to get away from a repugnant war-time status, we have destroyed almost overnight a defense machine which took several years and all of our national strength and resources to build.

The least that we can do is not to let all of it go to pieces. If the present trend should continue long, it would take us one to two years to get going again in case of an emergency.

The national industrial reserve is designed to halt or slow down that trend. Unless we have completely forgotten so soon the lessons of 1940, 1941 and 1942, we should know that defense production rests upon a solid foundation of adequate machine tool supply.

That is why the armed services are busy tagging the machines which should be put aside "just in case." That is why H. R. 3670 should be passed without delay and a similar bill pushed through the Senate.

Write your Congressman now and urge him to support this essential defense measure.

Burnham Finney

EDITOR

Shape - Form - Shear

...ON A "CINCINNATI"

Today Cincinnati Shapers are more efficient than ever before with heavier cutting capacities and speeds up to 200 strokes a minute on the 16"; and with a degree of ***accuracy*** that has never been excelled. Their power rapid traverse; multiple cam feeds; direct reading dials; and automatic oiling sell discriminating buyers. Coupled with these mechanical features are convenient controls; simplified adjustments; and means for quick and easy set-up, all of which please the operator.

Cincinnati Shapers are built in regular or universal type from 16" to 36". Ask for Cat. N-3.

See these machines under power at the Show

Cincinnati Press Brakes, the brakes of many uses, are today's machines for bending, forming, flanging, or multiple punching sheet metal. For easy fabrication, formed parts must fit; therefore ***accuracy*** is a fundamental advantage of these Brakes. Full-rated capacities; all-steel construction; built to withstand overload; deep bed and ram to avoid deflection are a few of the high points. These Brakes are built as accurately as a machine tool, and have unusual mechanical refinements.

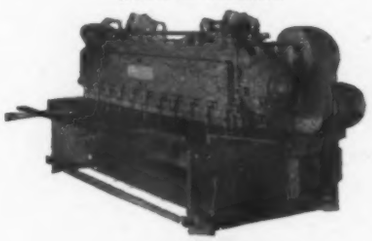
Sizes to cover practically any requirement. Ask for Cat. B-2

See these machines under power at the Show

Cincinnati All-Steel Shears offer a new degree of ***accuracy*** in shearing sheet metal. They cut to tolerances that take a micrometer to measure; and shear with this ***accuracy*** at high speed. They shear a wide variety of material in both ferrous and non-ferrous metals. Hydraulic holddowns automatically clamp any gauge of metal with the same firm pressure; fine adjustments for the four-edge knives give more efficient use of the keen edge and longer life. Rapid, accurate gauging speeds up handling of the job.

Standard capacities of Shears range from 10 gauge to 1¼ inches. Ask for Cat. S-4.

See these machines under power at the Show



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

See these machines in action at the **Machine Tool Show** Chicago, Sept. 17-26, **Booth No. 417**

What is

"ACCELERATED DEPRECIATION"?

Loose and careless use of the term is threatening to obstruct the way to more sound tax procedures. Mr. Blackall suggests Internal Revenue accept consistent depreciation accounting without duplicate deductions

BY FREDERICK S. BLACKALL, JR.
PRESIDENT AND TREASURER, THE TAFT-PEIRCE MANUFACTURING COMPANY
DIRECTOR, FEDERAL RESERVE BANK OF BOSTON
A Special American Machinist pre-Show Report

THE SPECIAL dispensation granted by our government during the recent emergency to acquire machinery and equipment for wartime purposes, with the privilege of amortizing it over a five-year period, brought home to industry in vivid manner the important effect which depreciation (for practical purposes indistinguishable from amortization) has on earnings, and the influence which it exerts on buying policies. It also brought into the jargon of U. S. industrial accounting a term heretofore little used, to wit, "Accelerated Depreciation." This was a natural development, for the term had been used widely to designate the five-year amortization plan under necessity certificate. Unhappily, however, the term no sooner came into common use than it began to acquire a number of other meanings more or less unrelated to the original intent. A good deal of confusion and misapprehension grew out of this, which has tended to intensify the opposition to a constructive solution of the problem of federal depreciation policy.

Abnormal Depreciation

For example, as the conflict drew to a close, businessmen began to face a war-related depreciation problem on machines which had been purchased for regular account without government assistance. Although this equipment was being depreciated at normal peacetime rates, it was being used in some cases as much as 24 hours a day, 7 days a week. Thus it was wearing out at two to three times its normal peacetime rate, and accounting-minded businessmen rightly demanded, though for the most part with indifferent success, that this abnormal wear and tear should be reflected in appropriate and additional deductions beyond the normal rate for the purpose of determining net taxable income. In brief, they sought to "accelerate" their normal rates of depreciation in more or less direct relationship to the accelerated schedule at which the depreciated equipment was being operated. This process in turn began to be referred to as "Accelerated Depreciation." A better term would be Extra Depreciation for Abnormal Use, or simply, perhaps, Abnormal Depreciation.

Liberalized Depreciation Policy

Ever since the issuance of the famous TD-4422 in 1934, however, students of accounting and corporate fiscal policy had been scrutinizing with a jaundiced eye the depreciation policies of the federal government. A considerable group of them were coming to the conclusion that the Treasury was standing in its own light by pursuing a conscious policy of stretching the so-called useful life beyond all reason. In brief, they were proposing with increasing vigor that the government should withdraw TD-4422, should allow greater latitude to the taxpayer in establishing his own depreciation rates on any reasonable basis which appeared to cover his particular conditions, provided only that he stick to them consistently.

Furthermore, there was a growing feeling that the burden of proof as to the lack of reasonableness, if any, should be placed on the Treasury Department, rather than on the taxpayer, and, not least important, that the factor of obsolescence no longer should be ignored in this connection. Because it was inconceivable, after 14 years of publication of TD-4422 by Treasury field agents, that anybody under such a proposal would want to depreciate his capital assets for tax purposes *less* rapidly than he was now doing, people began to speak of this proposal, too,

SEVEN DIFFERENT KINDS OF "ACCELERATED DEPRECIATION"

AND SOME COMMON ARGUMENTS FOR AND AGAINST THEM

	KIND	ADVANTAGES	OBJECTIONS
1	**Five-year Amortization under Necessity Certificate.** The privilege granted war producers during the national emergency, which proponents would make a permanent feature of our tax laws.	It enables the taxpayer to visualize clearly the recapture of his capital investment over a period for which he reasonably can plan. It is a proved stimulus to capital investment.	Selection of a 5-year period is too arbitrary, too inflexible. Makes no provision for tailoring the "useful life" for depreciation purposes to actual conditions within taxpayer's plant. Has no relationship to the actual useful or efficient life of the asset.
2	**Extra Depreciation for Abnormal Use.** An allowance made in addition to depreciation at normal rates and limited to a stipulated period during which the asset was subjected to abnormal wear and tear.	A just recognition of factual conditions.	The objection most commonly raised by tax examiners is that abnormal use is usually offset by abnormal maintenance expense, which tends to maintain the asset in "normal" condition.
3	**Liberalization of Federal Depreciation Policy.** This term, while general in character, usually applies to a withdrawal of TD-4422 and shifting of the burden of proof as to the reasonableness of the rates applied, from the taxpayer to the Treasury Department.	It recognizes the obvious fact that the taxpayer is a better judge of the useful life of his assets than an outsider. The withdrawal of TD-4422 would remove a serious deterrent to capital investment.	The fear by the Treasury of an immediate loss of revenue (which disregards the fact that revenue lost now would be recaptured later).
4	**Free Depreciation** A grant to the taxpayer of the right to select any rate which he may choose, even up to 100% in the first year.	It would unquestionably be a powerful stimulus to capital investment.	It is claimed that this proposal, if adopted, would make it difficult for the government to deal with obvious cases of abuse.
5	**Fixed Percentage on Diminishing Balance.**	It concentrates the major portion of the write-off in the early life of the asset, when shrinkage of resale value is most rapid. Residual book value of the asset during its later period of life is more likely to be in line with actualities than under the straight-line method. Saves the Treasury's face by requiring the taxpayer to retain the same useful life as under the straight-line method.	In many instances, it would involve retention, for purposes, of a useful life which is far beyond reason, and one which wholly fails to recognize the obsolescence factor.
6	**Raising the 150% Limit on the Treasury's Fixed Percentage on Diminishing Balance Method.**	Raising the limit to 200% or more would bring this method more in line with actualities.	The Treasury's usual fear of losing revenue.
7	**Consideration of Replacement Costs in Determining Adequate Depreciation Rates.**	This would give recognition to the obvious fact that the taxpayer has not registered a true profit in any given year until he has accrued a sufficient amount to offset that year's share of what he will have to pay for replacement of his wasting assets.	If this plan were to work with theoretical accuracy, rates would have to be adjusted continually in consonance with changes in the capital goods price indices.

as "Accelerated Depreciation." This is, of course, a complete misnomer. Liberalized Depreciation Policy would be far more accurate and succinct.

Accelerated Depreciation

As a development of the foregoing proposal, it has been suggested that the taxpayer be given *complete* freedom of choice of the rates or useful life which he uses for tax purposes, subject only to the provision of adequate safeguards to assure no duplication of deductions. For this procedure, some economist has coined the term "Free Depreciation," which possesses the virtue of brevity if not of clarity. But the general public, ever careless of its terminology, has tossed this one, too, into the general hopper of "Accelerated Depreciation."

Fixed Percentage

Even the "Fixed Percentage on Diminishing Balance" method of depreciating capital assets is sometimes miscalled "Accelerated Depreciation," although it is nothing of the sort. Under comparatively recent Treasury regulations, the Internal Revenue Department has been allowing taxpayers to employ this method of writing off their capital assets, but it has limited the rate to a figure not in excess of 150% of the straight-line rate formerly employed. This limitation largely nullifies the advantages of the method. The proposal to raise this limit is also sometimes dubbed "Accelerated Depreciation."

Finally, in an era of constantly rising prices, management becomes rightly concerned over the problem of replacement costs. It is a very serious matter to the man who holds the purse strings when, as at present, it is necessary to put up anywhere from 200% to 300% of the original investment when an old machine is replaced with a new one. If the cost of a new asset which replaces a fully depreciated asset is double that of the original, then the owner obviously has recovered only half of the investment necessary to replace the old asset in kind. Under these circumstances, it is not surprising that an urgent demand has arisen for consideration of replacement costs in arriving at a proper depreciation charge. The philosophy here is that the Treasury should allow the taxpayer an extra deduction before arriving at net taxable income, to be spread in some manner over the allowable useful life to compensate for the increased replacement cost. While accountants and economists normally would not classify such an allowance as accelerated depreciation, the proposal is frequently linked with it and occasionally confused with it.

It is significant that many who oppose the first and second forms of "Accelerated Depreciation" are quite willing to go along with one or more of the others.

Since even the hidebound classicists among the accounting profession agree that business is entitled to a reasonable useful life in accounting for its capital assets, and since there is hardly less unanimity that TD-4422 has stretched the useful life beyond the elastic limit, especially when the obsolescence factor is considered (as the law requires, but the Treasury largely ignores), it becomes important to define our terms if we would gain support for a sound liberalization of federal income-tax depreciation accounting procedure.

While the five-year amortization plan has its proponents, a majority of businessmen wants freedom of choice, or at least reasonable freedom of choice, coupled with full recognition of the obsolescence factor. After all, what difference does it make to the Treasury Department? The revenue which is lost today through larger write-offs simply sets up that more rapidly a broader tax base or the taxation of future revenue. But it makes a world of difference psychologically to the buyer of capital goods to be able to contemplate the recapture of his capital investment within a visible future period.

Brake on Progress

How much longer must we brook disregard of both law and reason by the Treasury Department? Its policy is a brake on industrial progress and our national productive efficiency. Curiously, the policy does not even stem from the political administration which brought the present Treasury administration into being. President Roosevelt himself publicly acclaimed the potential benefits of a more liberal policy in the allowance of depreciation deductions. Some of his Cabinet members have done likewise. But the Treasury sticks doggedly to its guns on the fallacious assumption that any shortening of the useful life of capital assets would tend to give business something or nothing, and something to which it is not entitled.

Revenue Would Rise

The fact is, that a liberalization of federal depreciation policy would increase rather than decrease federal revenue over the long pull. Such a change would provide a powerful impetus to capital investment, would offer an ever-present incentive to industry to maintain our nation's productive mechanism at a peak of efficiency. It would tend materially to dampen the swings of the business cycle. All of these things add up to the fact that liberalization of federal depreciation policy would tend to *increase* our national income and thereby to broaden the tax base substantially.

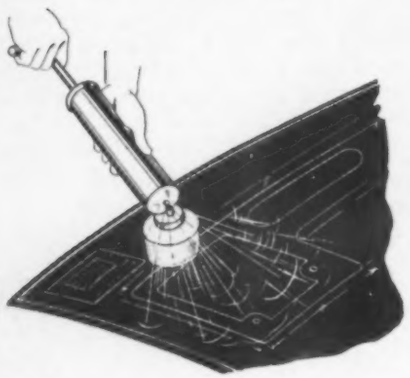
There are signs that this basic truth is beginning to permeate the Washington consciousness and that remedial measures may be taken in the situation by the Congress; but if Business wants genuine relief and reform of past errors in policy, it should distinguish clearly between the several forms in which the term "Accelerated Depreciation" is used. Business should be sure when it seeks relief through a grant of accelerated depreciation that it knows clearly what it is asking for. Perhaps, indeed, it would do well to discard the term altogether.

WHAT BUSINESS WANTS

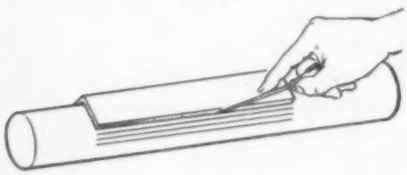
What Business wants is liberalization of federal depreciation policy, to the end that Business will not have to keep two sets of books in order to maintain its plants on a stable basis of mechanical efficiency. In the absence of compelling reasons to the contrary, the Internal Revenue Department should be prepared to accept any basis of depreciation accounting procedure which the manufacturer is prepared to follow consistently, subject only to the stipulation that it will not give him, under any possible circumstances, the benefit of duplicate deductions.

Short Cuts FOR THE SMALL SHOP

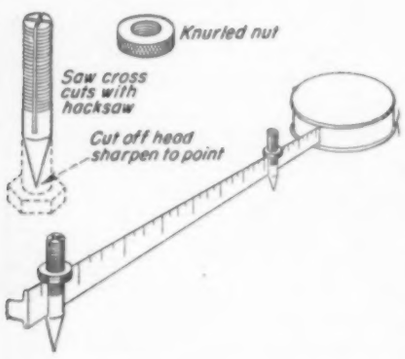
BY A. H. WAYCHOFF



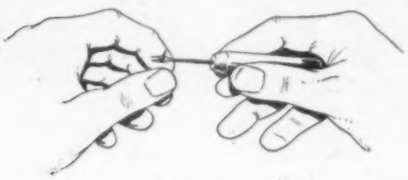
LACQUER sprayed on blueprints prevents soil and wear that often lead to mistakes because of illegible details and dimensions. A good clear lacquer can be applied easily with a common insecticide spray gun. Smudges are easily cleaned off the lacquered surface with a cloth dampened slightly with gasoline.



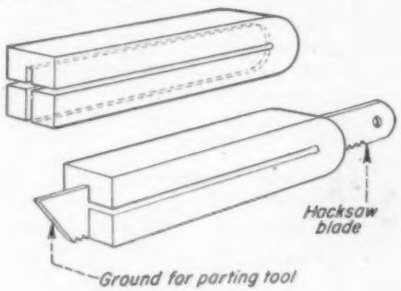
LAYOUT of parallel lines on a bar is done conveniently with a scribing guide made from a piece of angle iron. True up the edges of the angle iron and mark them with a scale if desired.



BEAM-COMPASS attachments allow one to use a steel pocket tape for scribing a large circle with sufficient accuracy for many purposes. Take two ¼-in. bolts about 1¼ in. long. Cut cross slots lengthwise in the screw with a narrow hacksaw blade. Cut off the heads and file to a sharp point. Assemble to the desired tape graduations by slipping one of the slots over the tape and applying either a hex nut or a knurled nut. The scale graduation will be visible through the unused slot. When the circle is scribed, the points can be removed, and there will be no damage to the tape.

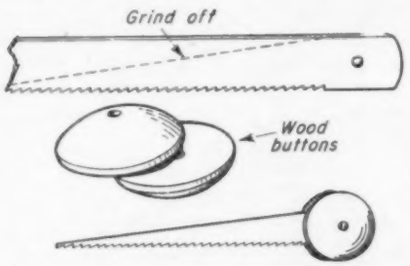


SPLINTERS, whether wood or metal, are often difficult to remove from the flesh with an ordinary needle. To make an effective splinter remover, snap the end off the eye of a darning needle, sharpen the two remaining points. To use, thrust the prongs into the flesh on either side of the splinter, twist slightly to lock the prongs about the foreign object, and pull. Actually, there will be less injury than if an ordinary needle is used.

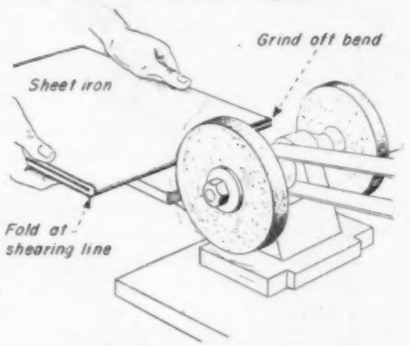


BROKEN power hacksaw blades make good parting tools if used in a suitable toolpost holder. One that works well can be made of a piece of cold-rolled bar ⅝x¾ x 14 in. Make a return bend at the center of the bar, then place in a power hacksaw to cut completely through the top leg and about halfway through the lower leg. Sharpen the broken hacksaw blade, assemble in the holder as shown, and tighten down the toolpost screw. The pressure will spring the holder sufficiently to grip the parting tool securely.

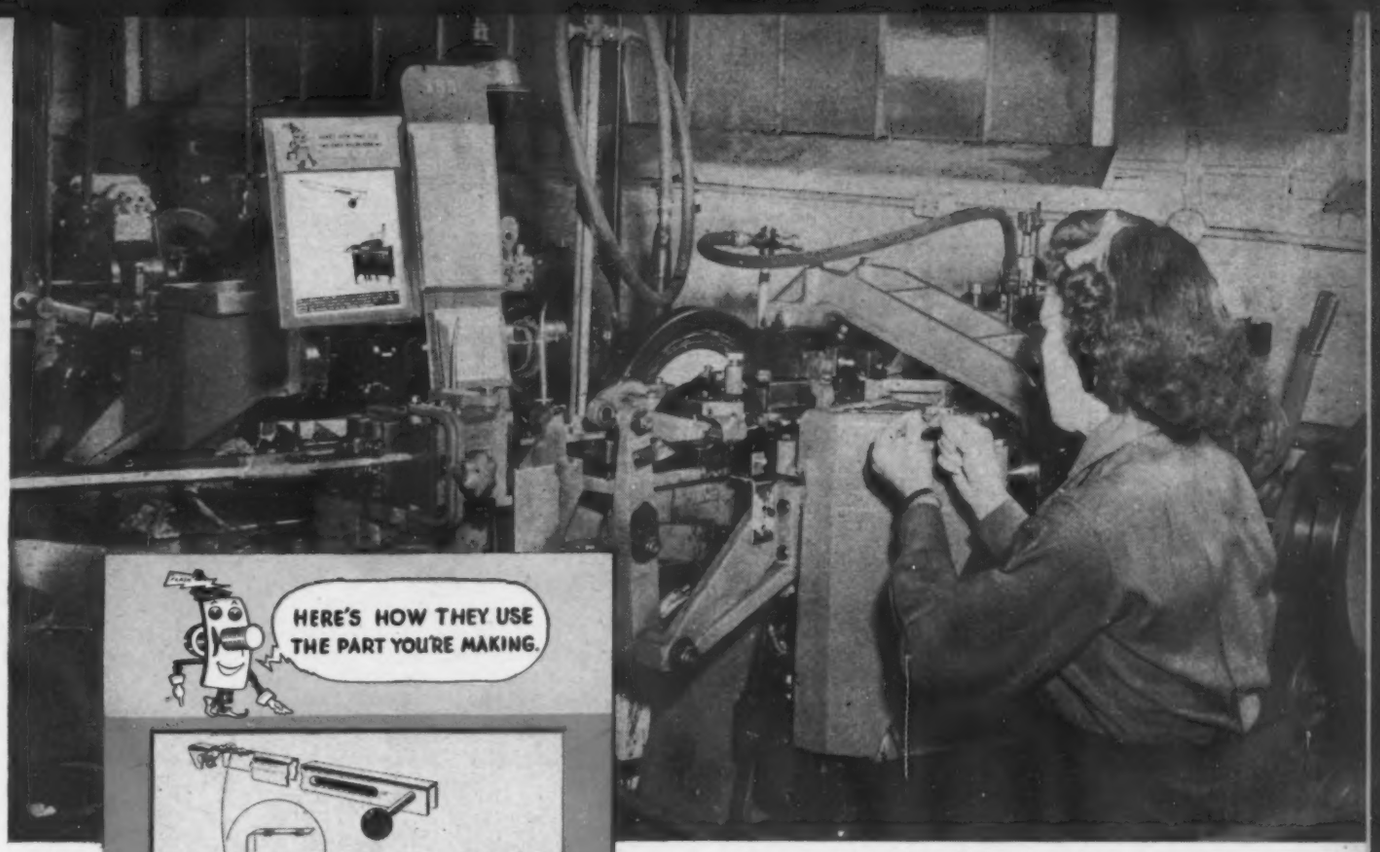
TO AVOID BREAKING the drill, when using a hand or breast tool, slip a small coil spring over the drill. Then, when the drill breaks through the metal, the spring will act as a buffer to absorb the thrust and the tool will not get out of control.



A "KEYHOLE" metal saw that helps one to start a cut, especially in tight places, can be made from a broken power-hacksaw blade. Take the longer piece of the blade, grind the back tapering to a point at the end opposite from the hole. Fasten two hardwood buttons about 2 in. in diameter to the hole or a grip.



SHEET IRON can be cut to a line by grinding on a snagging grinder if necessary. Often a shop does not have shears capable of cutting ⅛-in. stock and does not wish to spend the labor of cutting with a cold chisel and filing the ragged edge. In this case, the sheet metal is bent over flat and presented to the wheel.


HERE'S HOW THEY USE THE PART YOU'RE MAKING.
Here a special SPEED NUT serves as a quick-release latch for the automatic listing control arm on addressing machines. The spring arm of the SPEED NUT snaps over a pivot pin, to firmly attach the control arm to the listing mechanism.

PRODUCT APPLICATION POSTER is placed at left and rear of this automatic 4-slide machine and is visible to the operator but clear of mechanical action. The formed metal rack also has compartments for time cards and other job data. Preparation of each application card involves time and expense. First step is a sketch of the direct application of the Speed Nut in question in the sub-assembly prepared from field information supplied by the sales engineers. The end product is usually shown in a photograph and copy is prepared to explain the application. The finished job is mounted in a color frame

"How It's Used" Posters BOOST MORALE

BY HAROLD L. FLYNN
ASSOCIATE EDITOR

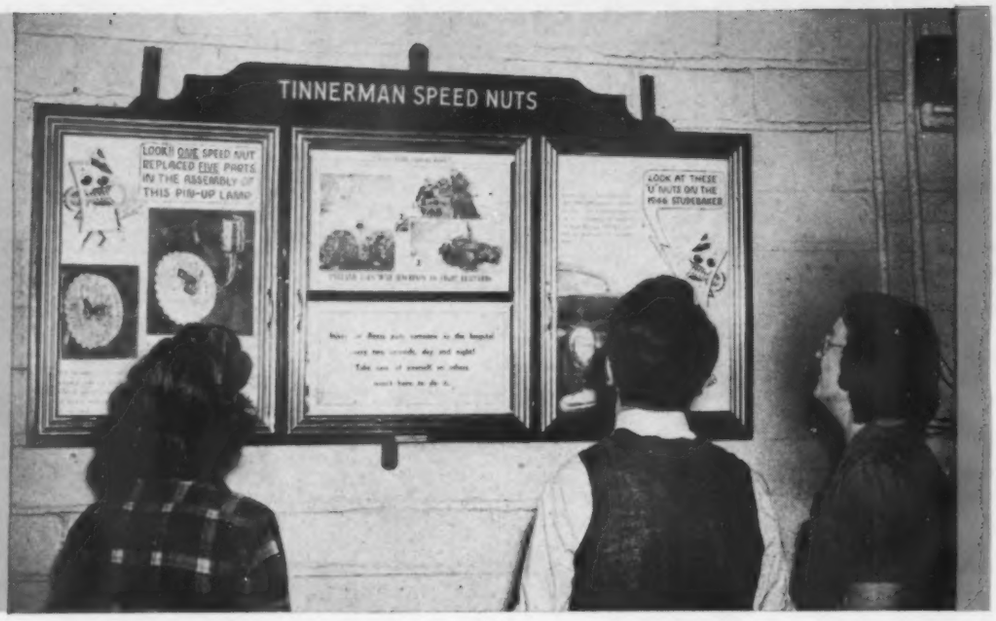
PRODUCT APPLICATION programs, designed to keep operators and plant personnel visually posted on where they and their operation fit in the industrial picture, have materially improved employee relations and morale. However, there are certain types of operations and products where programs of this type do a particularly good job, if properly administrated. One of the most outstanding of these is at Tinnerman Products, Inc., in Cleveland where over 4,000 different sizes and types of Speed Nuts are manufactured for thousands of industrial fastening and assembly jobs.

Here is a company manufacturing an essential part that is small in size and required in huge quantities. Ordinarily, and without cooperation on the part of plant management, the average operator would not necessarily know how any part would ultimately be used. It would be just another type of fastener to him and he would inevitably be inclined to lose a certain amount of pride and incentive in his job. After all he would feel "on the outside" and just responsible for a "numerical factor" or production quota.

Employee morale and incentive boosted at Tinnerman Products, Inc., by showing every operator where the Speed Nuts he makes are used in manufactured parts

Now, under the product application program at Tinnerman, every operator is constantly aware of how the part he is producing will be used, and will appreciate its importance in final assembly. This application is outlined to him through the use of photographs and line drawings mounted strategically on his machine. These visual setups on machines are usually changed once a week per machine, regardless of how long the production run of a particular part happens to be made. This prevents any chance of monotony by having one setup shown for, say,

WALL DISPLAYS, strategically located throughout the plant, supplement the operator product application cards on all machines, and live-product exhibits such as shown below are also in evidence in the restaurant and other gathering points


TINNERMAN SPEED NUTS
LOOK! ONE SPEED NUT REPLACED FIVE PARTS IN THE ASSEMBLY OF THIS PIN-UP LAMP
LOOK AT THESE U NUTS ON THE 1946 STUDEBAKER

"HOW IT'S USED" POSTERS BOOST MORALE continued

several months. During the war, programs of this type were in effect in many plants, some for morale purposes and some avowedly in the hope of increasing production. The Tinnerman Program was projected for the purpose of increasing employee incentive and morale and to help him visualize the broad significance of his part when applied in final assembly in industry. Increased production was not a primary objective and was not expected to absorb any part of the cost of maintaining this program. That production was increased, quality improved and many valuable functional suggestions received was incidental —although nonetheless appreciated by plant management.

A pattern of return is now appearing after a year's operation of the program. Employees have become increasingly articulate and cooperative, and show much more pride in their jobs. As a result the program will be continued indefinitely and even more cost and effort will be put into it.

Mechanical and psychological efficiency of such programs is best attained by combined efforts of the advertising, sales and engineering departments. The sales and engineering departments take the first step in setting up a new production application visual by approaching the customer and obtaining product information and photographs from him. The engineering department then supplies the necessary functional drawings to supplement the product photograph. From there on the advertising department takes over and completes the presentation and layout.

Mounting frames have been standardized throughout the plant, employing art work and three colors. The frames, when completed, are slipped into sheet-metal racks which are located free of operator or machine function and yet visible at all times. These racks are numbered to correspond with certain machine units and have extra compartments for time and job cards. Displays, both wall-type and actual product, are used to augment this program and have been equally effective in bringing to the employee a constant recognition of industrial product application. Here too, a distinct effort was made to maintain interest and provide added information by changing the displays at relatively short intervals. This prevented the inevitable discouragement that results from haphazard application of such programs, where little or no effort is made to gain and hold the interest and cooperation of the employee by giving him a constantly changing layout and picture.

Move Machines, Not Jobs, in Production

BY JOHN R. GODFREY

APPORTIONING MEN and machine equipment to handle different grades of work economically and promptly is something of a problem. It is not good management to put a class 1 mechanic on a class 3 job or tie up a high-grade toolmaker's lathe on a job that can be done on a low-cost speed or bench lathe.

One very successful manager solved his jobbing department work by dividing his shop into three sections. The first had the best equipment and men with the highest skill. The second had good average equipment and men of average ability. The third section was made up largely of men with not much experience and with graduates from the training classes of schools and shops. Each department had a variety of tools for handling the average job.

The shop superintendent studied the work as it came in and assigned it to the different departments according to the class of workmanship required. Some of the simpler work could be handled by the third-grade men and other portions by the other two grades. In many instances parts of the same job would be distributed to all three departments so simpler work could be handled by lower-cost men. This saved money for the customer, high-grade men were saved for work requiring their skill, and less-experienced men were also kept busy—so everyone benefited.

Single Responsibility

Where possible, every job going through the shop was kept in the responsibility of one foreman. This is a good reason for not segregating the shop by the kind of work performed as was formerly done, with lathes, milling machines, drill presses and other machines grouped in separate departments. This meant moving the work from department to department, and every foreman had to study the job to give it the attention it should receive.

The average job requires drilling, turning, milling, planing or shaping, and perhaps grinding. Machines to do all these jobs should be under one foreman who can follow the work through the different operations. This arrangement also reduces movement of work and saves time, move tickets and other paper work. In addition, it reduces the chances of error and spoiled work caused by different foremen interpreting drawings and instructions in different ways. Concentrating the supervision has many advantages.

Generally speaking, it is much better to move machinery so as to have groups of machinery available for a variety of work than to continue moving work from one department to another. There is but one movement of the machine equipment as against constant movement of the work.

Exceptions to this are the comparatively few plants where some machines are so large as to make moving them entirely impractical. In such cases, where special heavy foundations have been installed, such as for large boring mills or planers, it is better to rearrange the plant regardless of them. Or it may be possible to include them by bringing other machines into the same building.

Work of this unusually heavy nature is in a class by itself and need not be considered in the average shop. The main factors to be considered are concentrated supervision of work and reducing work movement as much as possible.

The Old Reliable Tap Extractor

HARRY A. LIVINGSTON
Holyoke, Massachusetts

They say the joke about the broken tap is taboo, out, and worn threadbare. Don't you believe it! This happens every day of the year, and to the best and worst of us. To describe its depressing effect is useless, but its solution, Ah me!

Yes, we had just about finished another choice Rube Goldberg fixture, save a few ¼-20 tapped holes, and production would start. But since tapping through 1⅛-in. of ordinary cold-rolled steel without benefit of counterbore does occasionally require the lowering of one eyelid, I, accordingly, used a No. 5 drill to play safe. Picked a two lip gun-tap and proceeded by hand since the thing wouldn't readily fit under the tapping machine arm.

After several good hits with home-runs, something gummed up with the bases full. Yes, indeed! The United Nations have their problems. The Greeks had a word for it, Toot sweet!

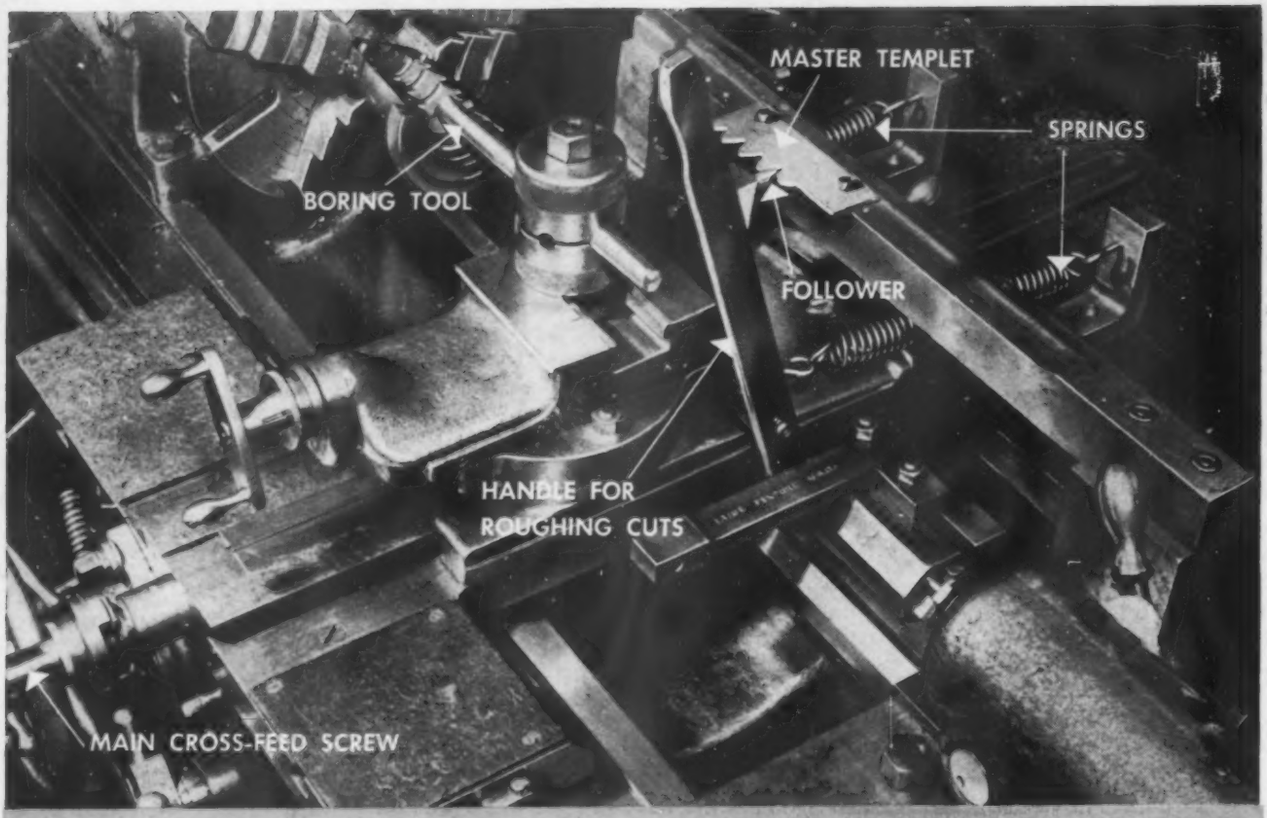
Here, the water boy got the bats mixed up, and the opposition developed a squeeze play over on the outfield bleachers, just prior to staging a comback, when . . . There was a piece of tap jammed in the bottom of the hole. Now this was something to think about. Temptation reared its ugly head.

Now this particular hole location was, let us say, purely incidental. We could plant another immediately alongside and leave the tap remains buried for posterity to ponder on.

No, oh no; not to me you can't. Leaving it there was impossible. After the dust had settled and the florist's order cancelled, saneness returned. I decided without further ado that No. 2 tap must come out, with a capital M. There were no two ways about it, and out it eventually came, though not with any of the patented gimmicks that the crib had to offer. Yes sirree. Just an ordinary round punch; a discard from an old die-set. Previously used to punch ¼-in. diameter round holes on a progress die. Made of usual tool steel. Rockwell 58-60 and ground down to an oval pencil point.

This tool was pounded down between the lips of said tap, then again just outside said tap, to cave in and break into pieces all possible. Then with judicial use of small tip of acetylene torch to avoid disfiguring work, with slow speed drilling and more trepanning, the hole was eventually cleaned out with less work than required to tell about it.

Redrilling and tapping with larger plug, finally drilling with a No. 7 drill for the last and final homerun in favor of the home team.



TRACING DEVICE permits machining of irregular shapes on inside diameters with tool controlled by roller following master templet

Operators Solve Machine Modification Problems

Product changes often require changes in machines. Here are three examples showing how operators can help in these modifications

BY H. W. LANCASTER
TOOL SUPERVISOR, GENERAL ELECTRIC CO., PITTSFIELD, MASS.

ADAPTING existing equipment to meet new production demands is a problem constantly besetting manufacturing supervisors. Sometimes this can be done by regular machine designers; frequently the original builder of the equipment can be of assistance. Upon occasion, however, the most useful and practical suggestions come from the operators of the machines themselves. Sometimes these modifications are so simple and basic that they seem impossible or impractical.

This was the case recently at the Pittsfield Works of the General Electric Co., when the suggestions of three workers resulted directly in the successful adaptation of basic machine tools.

1 IRREGULAR BORES CUT WITH TRACING DEVICE

A TRACING DEVICE, developed for machining irregular shapes on inside diameters, features two springs to maintain tension of the tool against the pattern.

The master templet, fastened to the taper attachment of a lathe, is made the same shape and size as the hole to be bored. Either a boring or turning tool is fastened to the toolpost in a conventional manner. The main crossfeed screw is detached, and all feeding is done with the compound rest. Depths of cut are governed by tension of the two springs on the back of the compound rest, and finish diameters are governed by the roller following the master templet. A handle on the side is used for roughing cuts when it is desired to remove more stock than spring tension will permit. The device can be applied to any lathe by varying the construction to fit the conditions at hand.

An advantage of this device is that it assures duplicate work, as the master templet is a guide for the cutter. In addition, inside boring is easier to follow on irregular shapes,

because the tracer on the templet follows the same course as the cutting tool, and the operator can watch the tracer and templet, instead of the boring tool. The tool and tracer move as a unit, in effect giving the operator the same visibility of the cutting tool as he would have if outside machining were being done.

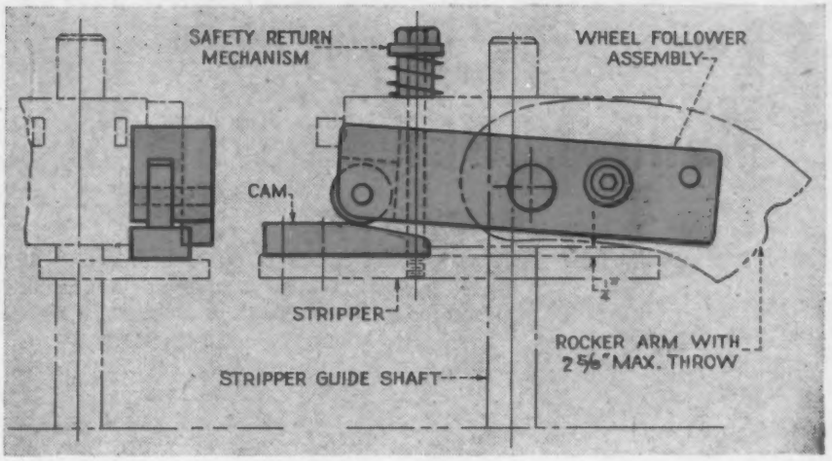
2 EXTRA STRIPPER TRAVEL ON MULTISLIDE MACHINE

One recent production problem, made it necessary to increase the stripper stroke of a multislide machine from the existing maximum of 2⅝ in. to 2⅞ in. An operator suggested a solution that seemed practical, but the builder of the machine said that, in his opinion, it was impossible. However, it was decided to try the suggested development.

As shown in the drawing, two plates and an extra ⅝-in. bolt were added to strengthen the rear form station. Next, the stripper action was increased ¼ in. by a combination of roller and cam wedge, spring action, and change in stripper support.

With this modification the stripper itself is free to slide on the stripper support shaft. As the rocker arm moves forward during a standard 2⅝-in. maximum stroke, the wheel follower engages the cam wedge to force the stripper down another ¼ in. The safety-return mechanism, consisting of a stud, washer, sleeve and spring, assures the safe return over this ¼-in. distance.

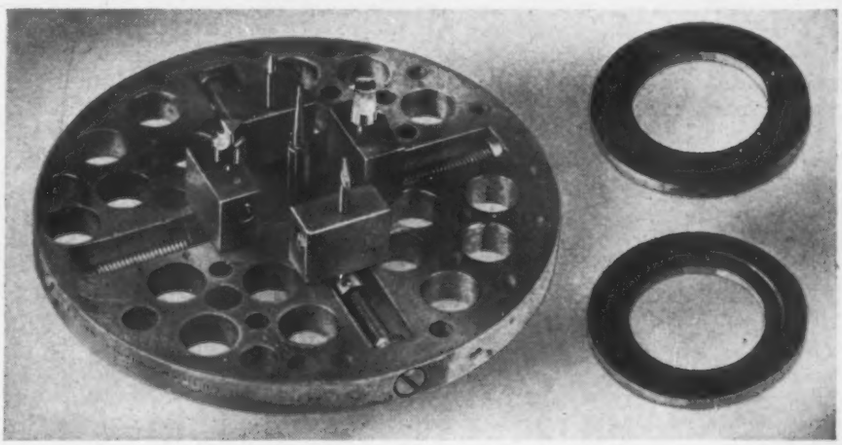
The attachment has been in use ever since its installation, proving its practicality.



STRIPPER TRAVEL is increased ¼ in. on multislide machine by a combination of roller and cam wedge, spring action, and a change in stripper support

3 GASKET CUTTER ADJUSTS TO FIT NEW DESIGNS

IN THE manufacture of electric equipment, gasket cutting is a constant problem because the shapes required change so completely with new designs of equipment. A worker recently suggested a gasket cutter that has proved extremely adaptable for use in a drill chuck. It is small, light, and easily and accurately adjusted.



GASKET CUTTER mounted in a drill chuck cuts gaskets from ¼- to 6-in. dia. with grooves or recesses when required

The device will cut gaskets from ¼-in. to 6-in. dia., and with careful adjustments, the gaskets can be held to micrometer measurements. Additional cutters can also be inserted and used for cutting accurate grooves and recesses. Procedure for using the cutter is to put the gasket material to be cut on a Masonite board or some similar material, which holds the material flat and will not allow it to move, assuring a perfectly round hole.

The centering pin on the tool removes the possibility of cutters not following a true circle, and also acts as a center for layout purposes. This is of assistance in utilizing material efficiently to produce the maximum number of gaskets.

LUBRICATING ANTI-FRICTION BEARINGS

Needle bearings are now being widely used in multi-spindle drillheads and other shop applications to allow close spacing and free action. According to The Torrington Company there are four methods of supplying extra lubricant to these bearings:

1. Where lubrication through the housing is feasible, the needle bearing may be furnished with an oil hole in the center of the outer shell. In installation this hole is outside the load zone.
2. Where lubrication through the shaft is desirable, a hole through the shaft leading under the lip of the needle bearing is satisfactory.
3. For low speeds and light loads the needle bearings may be packed with grease.
4. For high speeds and heavy loads a circulating system is preferred so as to carry away some of the heat usually generated under these conditions.

For most operations a grease will give the best results, with exceptions of extremely high operating temperatures or speeds above 3,000 rpm., where oil is recommended.

Effective Layout and Handling Mean Lower Costs, More Production

Switchbox production at Square D benefits from straight-line flow and fast conveyorized handling in the wash and paint

BY HARRY S. WHAREN
ASSOCIATE EDITOR

A QUARTER MILLION devices a month, from small switches to large switchboards and power-panels, mean a lot of handling. With smallest products having 60 to 70 parts each and larger ones having hundreds of parts, handling them from raw stock through fabrication and assembly is a job of gigantic proportions—a growing job as material becomes more available and as suppliers meet their delivery dates.

Sheet by sheet, part by part, assembly by assembly—all by hand or hand truck—is one way of handling—the mishandling way. But to get products out the shipping door at a competitive price demands modern, effective production methods.

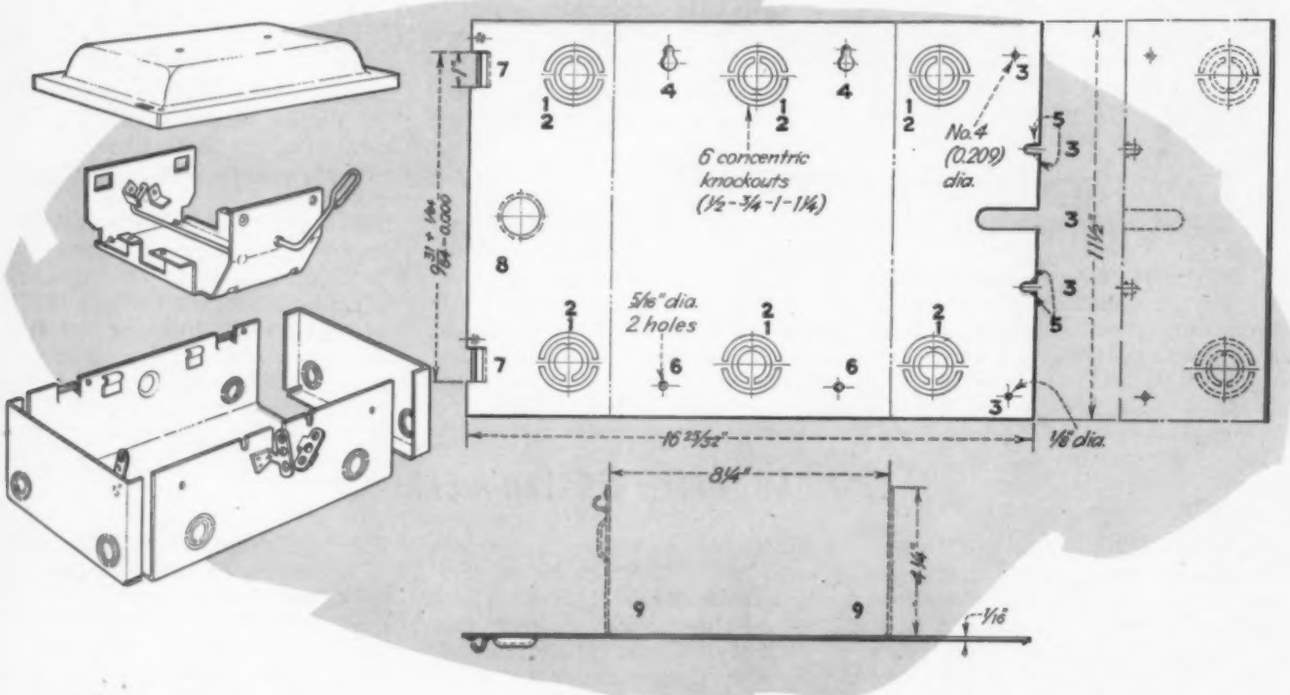
Management at the Square D Co., Detroit, not only realizes the responsibility of that precept, but also acts on it. Although faced V-J day with no reconversion program as to products, it was faced with conversion to modern handling methods.

Raw stock, in great part sheet steel, was manhandled from receiving to storage, then to production departments. Both raw stock and parts in process were handled, whenever possible, in skid loads by electric lowlift platform, hand lift and motorized hand trucks. Skids were of the usual steel-frame wooden-platform type, with or without boxes, depending on the material.

Although skid movement for many of the parts in process was desirable and will be continued, moving high-production parts through processing and sheet stock to storage and work areas warranted study to determine more effective methods. The latter problem will be solved by installation of a monorail system, designed to unload cars by means of a grab and move the stock to storage. By interlocking cranes, it will be possible to spot stock wherever needed in the two punch-press bays.

Planning the handling of high-production items, however, involves, besides a determination of the best methods, intensive study on their integration into production, especially difficult now because of equipment shortages. But as rapidly as equipment becomes available, departments are being relocated, machines rearranged, production conveyorized to cut down cross-traffic, back hauls and excessive work-area storage. Conveyors are being integrated with industrial trucks to form a fast-moving, compactly organized system of converting raw material to finished product.

Realizing that just buying a conveyor would solve no problems, Square D is rearranging plant lay-



SHEARED STOCK, *11½x16 25/32 in., is pressed and formed in 9 operations, as indicated by key numbers, to prepare it for welding of ends, lever stop and latch, and assembly of lever and cover to complete the switchbox*

out to take advantage of all the benefits that may be derived from straight-line production with a corresponding increase in productivity.

Switchbox production is an example of a medium-quantity job, running from 800 to 900 units per day and requiring several press operations, welding, assembling, washing, drying, painting, baking and delivery to final-assembly lines.

The press line, consisting of two Bliss presses and six Denison Multi presses, is arranged to reduce manual handling between operators and to permit an operator to handle more than one press because production quantity does not warrant capacity operation of the line.

Sheared stock is brought by skid to press 1, on which six concentric knockouts are subpressed in 6 strokes. The next operator, who handles presses 2, 3 and 4, flattens the knockouts in 3 strokes on press 2, notches three slots and pierces a No. 4 hole and a ⅛-in. hole in 1 stroke on press 3, and pierces two keyslots in 2 strokes on press 4.

Gravity Eases Part Handling

The blank is delivered by gravity wheel conveyor to the next operator, who handles presses 5, 6 and 7. On press 5, ears are formed in 1 stroke in the two slots pierced in the third operation. Two 5/16-in. holes are pierced in 2 strokes on press 6, and on press 7 two hinge ears are lanced and formed and two spacing nubs subpressed in 2 strokes.

Carried on a second gravity wheel conveyor to press 8, the blank is formed with a 1⅛-in. boss in 1 stroke and given two right-angle bends on a 6-ft. press brake 9.

At station 10, the two ends are welded to the box on a Hydro-speed welder, and at station 11 lever stops and a latch are spot-welded to the box. Delivery between stations 10 and 11 is by means of a sheet-metal slide. From welding, the box passes through subassembly 12 where lever and cover are added, and is then hung on the overhead conveyor.

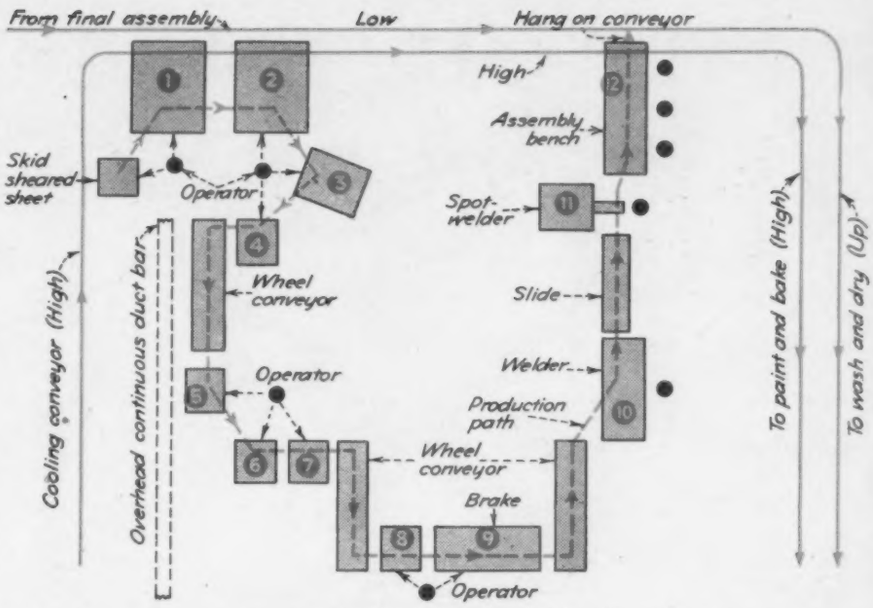
To lend flexibility to the production line if a change is required because of product redesign or plant rearrangement, the Multipresses are mounted on stands that can be picked up and moved by truck. When not needed for a particular box, they can readily be pulled out of the line for use elsewhere. Under this arrangement, five different boxes can be accommodated on the line without tying up equipment.

The overhead monorail conveyor passes from press layout through processing to final-assembly areas. Being of the Lindahl type, carriers are connected by solid rods working in universal joints and the conveyor can be arranged for abrupt vertical curves with radii as small as 2 ft. because of the 4-way guide wheels.

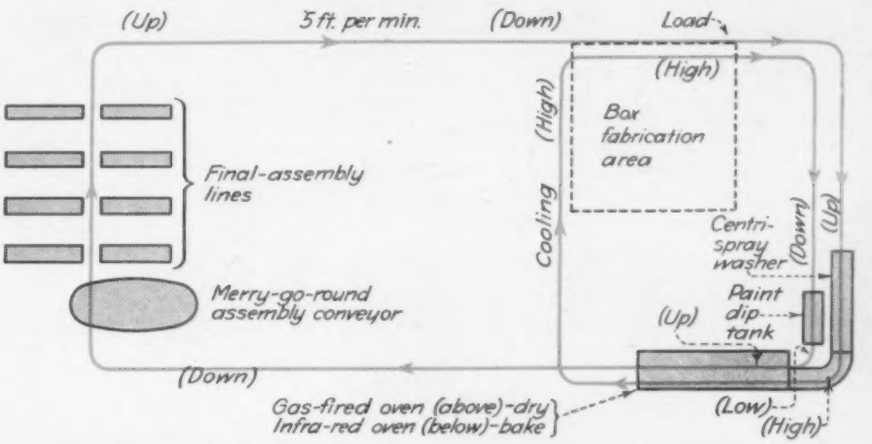
From the loading point, boxes are carried at 5 fpm. through a 19-ft. long Centri-Spray washer, rinse and a 30-ft. gas-fired, indirect drying oven held at 200 to 250 F. The conveyor then makes a loop to cool the parts before painting.

Boxes are painted by passing through a 10-ft. long dip tank and baked in a 30-ft. long infra-red oven suspended directly beneath the gas-fired drying oven. Parts then are conveyed to final assembly. One final-assembly line is a merry-go-round conveyor fed at one end from the overhead conveyor. Other lines are arranged at right angles to the overhead conveyor.

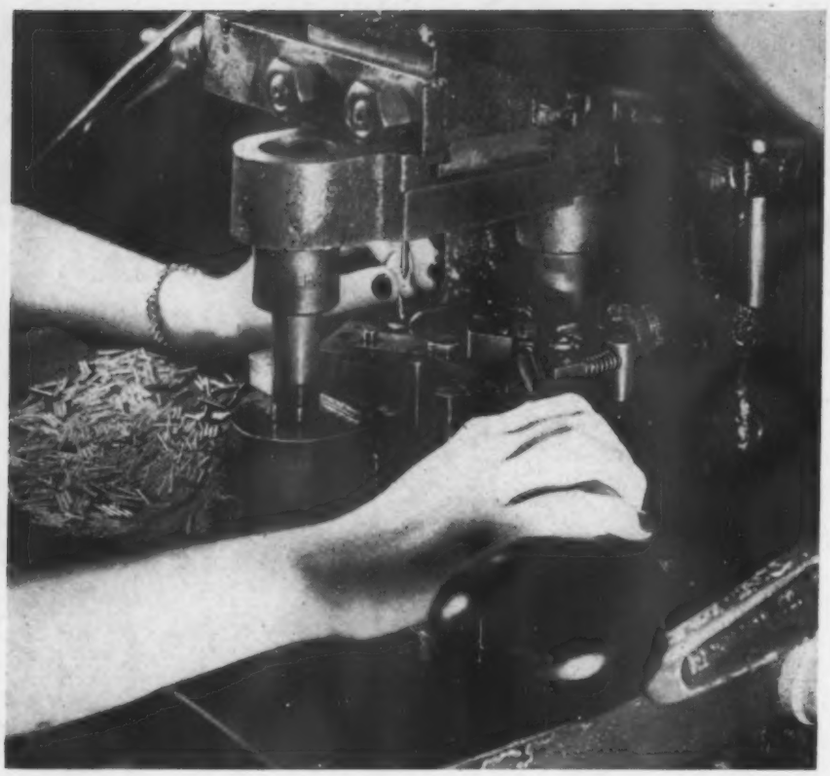
The combination of mechanical handling through processing and well planned equipment arrangement in the fabricating area is giving expected results — better parts, fewer rejects, increased production, greater worker productivity, lower fabricating and processing cost, and better housekeeping, production control and scheduling.



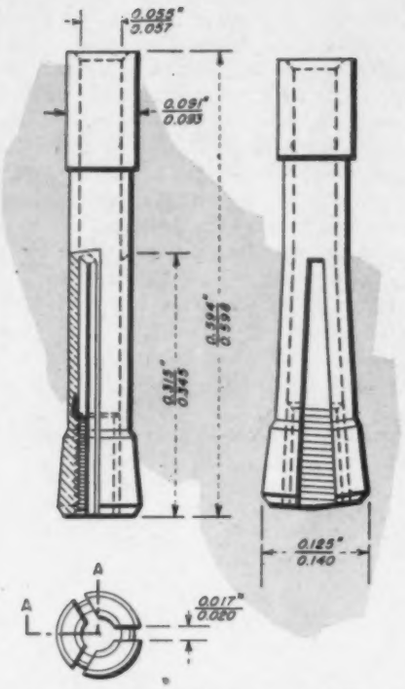
PRESS, WELDER AND ASSEMBLY *layout routes switchboxes between operations with minimum of handling and no cross-traffic or back routing. The arrangement allows two workers to operate three presses each and one worker to operate a press and a brake. Continuous duct bar provides flexible means of electrical connection*



SWITCHBOXES *from fabrication area are carried through washing, drying, cooling, dip painting and infra-red baking to final-assembly areas on an overhead monorail conveyor traveling at 5 ft. per min. Reduction in work-area storage effects floor-space expansion*



THE CLUTCH BLANK, finished on automatic screw machines, is set vertically between cam-locked clamp jaws, then a three-fluted punch is moved downward by the press ram to shear three slots in one end



CLUTCHES, machined from 0.105 x 0.0415-in. phosphor bronze (ASTM No. 139, Grade B-1) tubing, are slotted with a three-fluted punch. Kerf is removed in a bench press, then the collet jaws are bent open as shown

Clutch Slots Punched In

THREE SEPARATIONS SLIT IN PENCIL LEAD-FEED UNIT AT ONCE AT A RATE OF 25,000 PER MACHINE PER DAY

BY JOHN W. DEAN, JR.
General Works Manager,
EVERSHARP, INC.

SLOTS 0.315 to 0.345 in. long and 0.017 to 0.020 in. wide between the three jaws of the collet-type lead-feed clutch for Eversharp repeater pencils are cut 120° apart in a punch press faster than they could be machined by any other process. Clutch blanks are form-turned, drilled, tapped, countersunk and cut off from 0.105 x 0.415-in. phosphor-bronze tubing in automatic screw machines.

Large quantities of these clutches must be made every day (plant capacity is near 50,000 mechanical pencils every 24 hr.) so a rapid, accurate slot-cutting operation is essential. Milling would be too slow, even if a special machine using three slitting cutters simultaneously could be developed. We have found the three slots can be cut in one stroke of a punch press, using a three-fluted, sharp-pointed slitting punch and a cam-actuated holding die. Only two such units meet requirements for these clutches, and one setup does not operate all of the time.

The part is supported vertically in the slitting die, being clamped by action of cam-operated levers which move sliding die blocks against the part. It is placed by hand on a support bolted to the bottom face of the back clamp block of the die assembly.

The slitting die is assembled on a 4½ x 6 x 9/16-in. hardened and ground tool-steel plate bolted and doweled in a 4½-in. wide, 7/16-in. deep slot, milled and ground in the top surface of a standard Danly cast-iron die shoe with two steel guide pins. The back clamp block is bolted and doweled at one end of this plate. This block has in its forward end a hardened and ground tool-steel insert whose face is machined to fit the contour of the part. Spaced 120° on either side of the back slot are two movable sliding clamp blocks also fitted with hardened and ground tool-steel clamping inserts. The sliding blocks are held in position by and slide between pairs of hardened and ground tool-steel guides bolted and doweled to the die plate.

Extending vertically above each of the 0.625 x 0.750 x 2-in. sliding clamp blocks is a ¼-in. dia. hardened dowel pin which engages the jaw of the cam-actuated lever with which the sliding blocks are moved. Levers are hard-faced with Stellite welding rod on the side surface engaging the

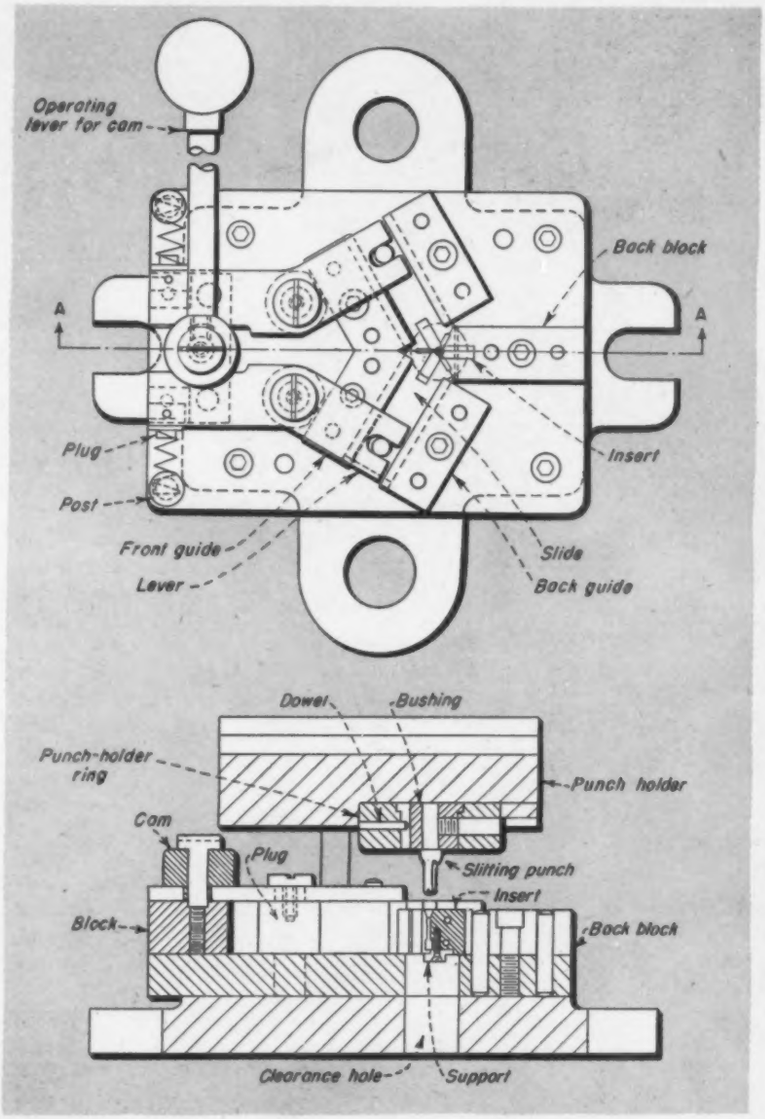
cam. These two actuating levers are supported ¾ in. above the dieplate on tool-steel plugs press-fitted into holes in the die plate.

At one end of the die plate, opposite the fixed clamp block, is a hardened and ground tool-steel block on top of which the cam is held with a shoulder screw. This cam is turned by a hand lever ⅜ in. in dia. and 6 in. long, with a file handle fitted to the outer end. On each side of the cam support block there is a post with a hole drilled horizontally near the top end to accommodate one end of a compression spring. The other end is fitted on the plug of a bracket welded to the underside of the actuating lever. Action of the two compression springs tends to keep outer ends of the actuating levers tight against the cam, thus opening the sliding clamp jaws when cam pressure is released.

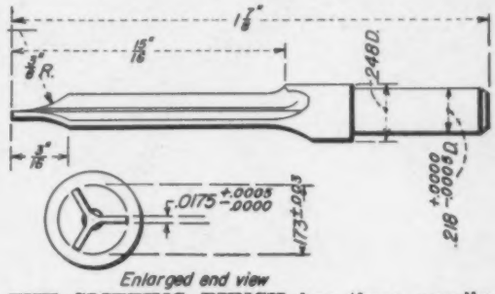
A simple punch-holder ring assembly is fitted into a 2 1/32-in. dia. 5/16-in. deep counterbore in the bottom face of the punch-holder plate. The slitting punch is held with a socket-head setscrew to permit easy alignment of the punch flutes with the clearance slots between the three clamp jaws on the die plate. As shown, the 1⅞-in. long punch has three equally spaced flutes 15/16 in. long ground on the lower end. The lower end is pointed for 3/16 in. along the 0.0175-in. wide flutes to give a shearing action to the cutting faces. Punches are made of drill rods, hardened and ground all over. Heat-treatment has been standardized thus:

Punches are packed in charcoal and heated to 1475-1500 F., then they are quenched in oil and drawn in an electric furnace where they are heated to 650 F. They are left in the furnace for 1 hr. to cool.

This slitting die and punch is used in a No. 0 Walsh single-crank press belt-driven at 1500 rpm. from an electric motor. As shown, the die set is placed on the bolster plate so the die plate is parallel with the crankshaft, bringing the two guide pins to the front and rear sides of



HAND-OPERATED CLAMP JAWS hold the work vertically in this die assembly for slitting. Opening and closing of the jaws is controlled by cam-actuated, spring-loaded levers which engage pins in the top faces of the jaws. Clearance is provided between the jaws for flutes of the slitting punch. A support block bolted to the bottom face of the fixed clamp jaw positions the work



THE SLITTING PUNCH has three equally spaced flutes 0.0175-0.0180 in. thick. They are ground from the 0.173-in. dia. lower section of the punch before heat-treatment. Body of the punch between the flutes is sufficiently small to clear the 0.044-0.046 in. min. dia. of the tapped large end of the clutch body

CLUTCHES ARE DEBURRED after slitting in this simple bench setup. Clutch parts are pushed through the die plates with the ram of a foot-operated press. The left-hand die plate is held closed with a hand-operated cam. When cam pressure is released, springs move this plate away, to permit the deburred part to drop into a chute leading to a tote pan under the bench. Air blast blows chips away from die members

the bolster plate. This arrangement positions the die so the operator easily can load blank work pieces into the clamping position with her left hand, while operating the cam lever with her right hand. While her left hand is reaching for another part, her right hand is moved a few inches from the cam lever to the press-clutch operating lever. At the end of each stroke, the press is stopped and the cam moved to open the clamp jaws. This permits the slotted piece to drop through the die plate and shoe into a pan under the press, clearing the way for the operator to position another piece quickly. An air jet over the rear sliding clamp jaw helps move the finished piece down through the clearance hole. The fluted punches have an average life of approximately 100,000 pieces.

Removing Kerf

The three small pieces of kerf slit from the work remain attached to the piece at their lower ends. For this operation, a small workbench with a No. 1 Greenerd arbor press is located near each crank press. The arbor press is altered to permit foot operation of the ram, leaving both of the operator's hands free for actuation of the die and for loading work pieces into the die jaws.

The standard ram is removed from the arbor press, as is the ram-actuating pinion and lever. A new ram with a longitudinal keyway to prevent rotation is fitted to the arbor-press frame. On the upper end of this ram is a stop collar, a heavy spring, and an arm to which is connected a chain or cable leading to a pedal.

A die assembly having one fixed and one movable jaw is mounted on the press table so the cam operating the movable jaw can be rotated by the operator's left hand. This leaves her right hand free to pick up parts from which kerf must be removed. On the lower end of the 7⅜-in. long, ⅞-in. dia. ram is a ⅜-in. dia. projection which, when the ram is moved down, presses the piece through the die jaws, thus stripping off the kerf. Operation of this tool is rapid, the operator easily keeping up with the production of the adjacent press.

In the burring die used on the converted arbor press, the jaws are assembled on a cold-rolled steel baseplate which is carburized, hardened and ground all over. This plate is machined so two sets of keys project above the top surface on either side of the die plate to hold the plates in proper alignment. Inner faces of these keys are ground to provide a space of 1.2510-1.2515 in. for fitting the 1.2485-1.2490-in. wide die plates. The fixed die plate is held in place on the base with a standard ¼-20 oval-head screw and two ⅛-in. dowel pins. A standard ¼-20 hex head bolt and washer holds the sliding die plate in position, being fitted through an elongated hole in the die plate.

Between the die plates are two small compression springs fitted into ¼-in. dia. holes drilled horizontally into the face of the movable die plate. Pressure of these two springs tends to keep the die jaws separated, unless held together by action of the 1-in. dia. cam mounted 3/16 in. off-center on the left-hand end of the baseplate. This cam is operated with a ¼-in. dia. 3-in. long handle.

An air jet in front of the die keeps die plates and base clear of scrap removed from the pieces as they are pushed through the cutting faces of the die plates. This eliminates any need for the operator to stop and clean scrap from the die.

OUR SHOP...26 — *Maintenance Dept.*

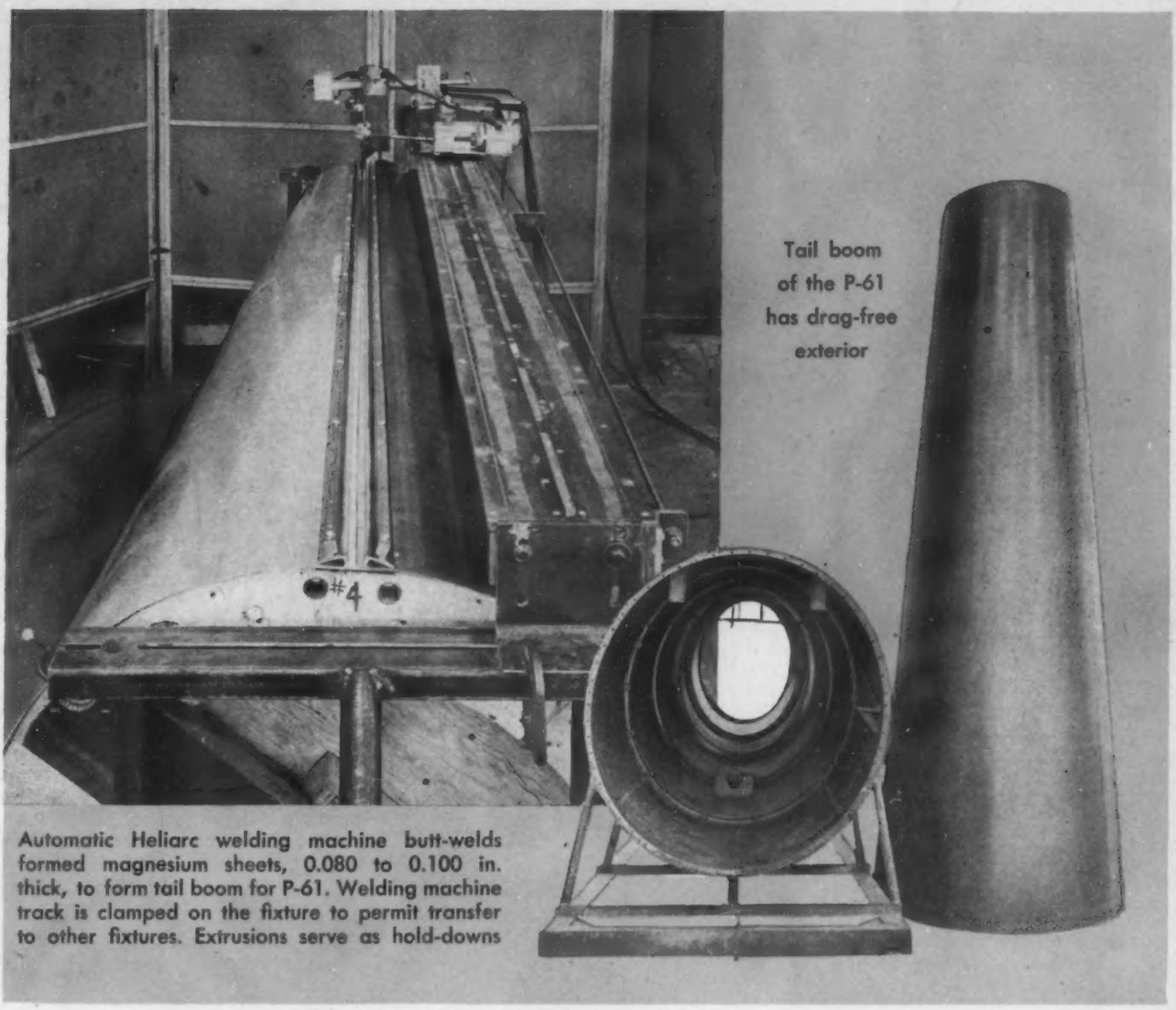
TIPS for Top Shop Men

194 Don't be too busy to see visitors with an idea—or subordinates with a problem. If you're too busy, they may soon be too.

195 For heaven's sake—and your own—RELAX! Any tenseness in your attitude will be multiplied in the attitudes of those around you. A catgut on a fiddle makes a nice sound when it's tense, but it has only one short life; a cat knows how to relax—and has nine.

196 Fast cutting alone isn't enough—you've got to supply materials, get work to the next operation, remove chips, just as quickly and efficiently.

197 If you find an ingenious man, use his ingenuity, just as you use the manual skill of a capable workman. Ingenuity can frequently avoid the need for later costly manual skill.



Tail boom of the P-61 has drag-free exterior

Automatic Heliarc welding machine butt-welds formed magnesium sheets, 0.080 to 0.100 in. thick, to form tail boom for P-61. Welding machine track is clamped on the fixture to permit transfer to other fixtures. Extrusions serve as hold-downs

Northrop Speeds Magnesium Fabrication

Hot forming of magnesium plate, electric dimpling and automatic welding cut time and cost in building all-magnesium aircraft

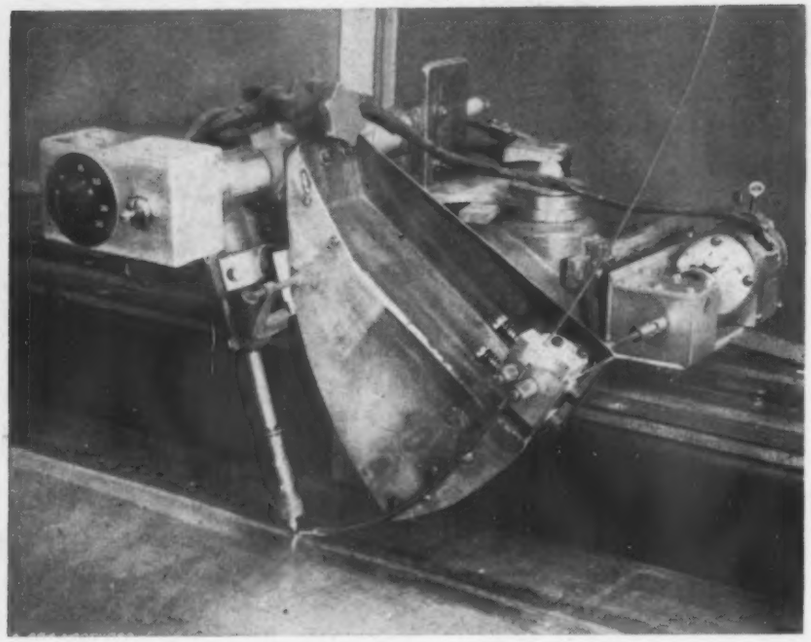
BY CHESTER RICKER
DETROIT EDITOR

BUILDING the XP-56, first all-magnesium, all-welded aircraft at Northrop Aircraft, Inc., led to development of new fabricating methods which have since been used in such planes as the XP-79 "Flying Ram," and the JB-10 jet-propelled bomb. Details of three of these methods are shown in pictures on these pages.

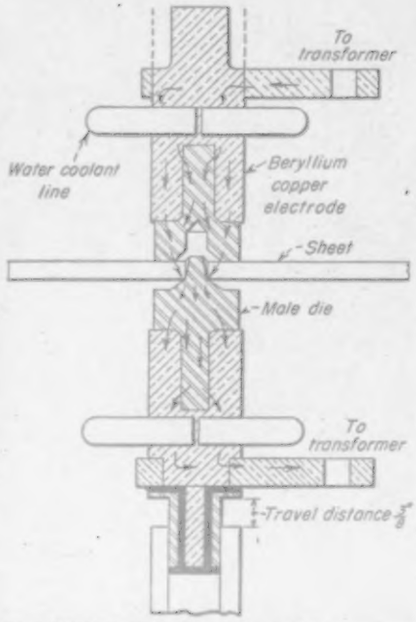
Heliarc welding was originally developed by Northrop several years ago and is now used for automatic welding of long seams. The flow of inert gas (helium or argon) around the arc eliminates the need for a flux. Development of the water-cooled torch permits the use of faster welding speeds.

Flush riveting is essential for aircraft skin construction. Dimpling magnesium for flush riveting must be done hot, and use of electrically heated dies is conventional. The resistance heating method developed by Northrop employs a portable spotweld transformer and electronic timer. During the compression stroke the timer is tripped and the area to be dimpled is heated before the dimpling takes place.

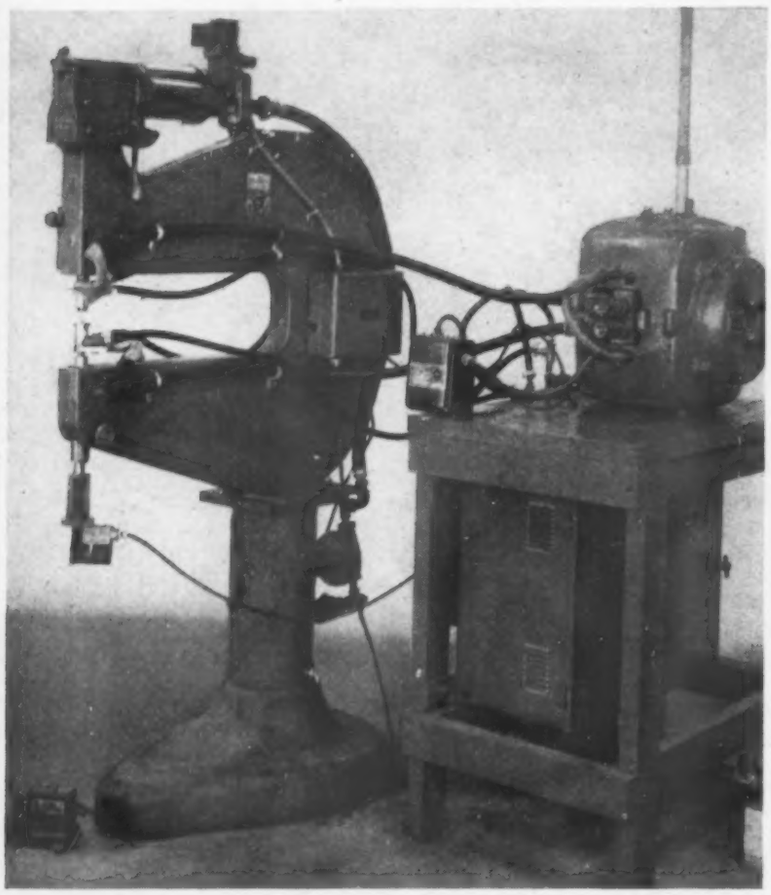
Hot forming of plate on an Erco stretch press over a heated Kirksite die has simplified operations and reduced scrap. On the part illustrated, "spoilers" (previously cold-formed on a press brake), a heat-treating operation was eliminated. On 876 sets it is estimated that 8,410 manhours would have been required by the former method compared with the 350 manhours by the new method. (Next page, please)



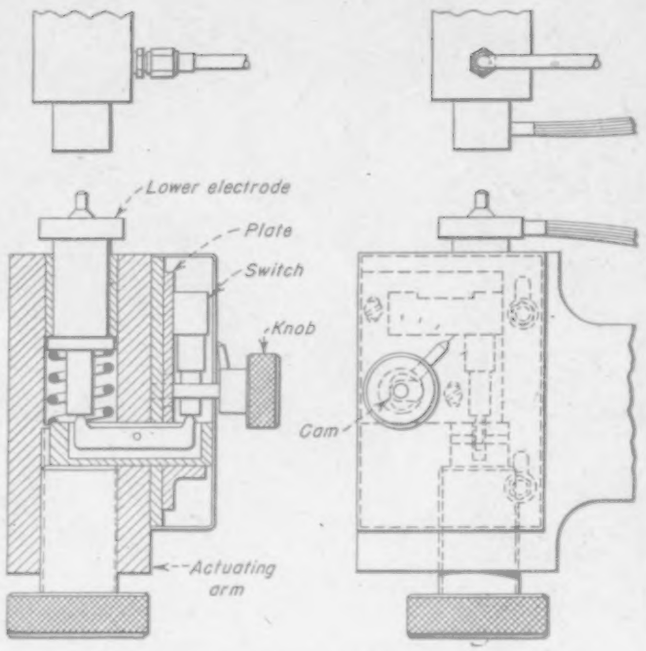
AUTOMATIC WELDING HEAD has electric-motor drive for welding rod. Hold-downs have been removed to give view of electrode holder which provides inert-gas shield and the weld head. Butt joints are welded at 36 ipm.



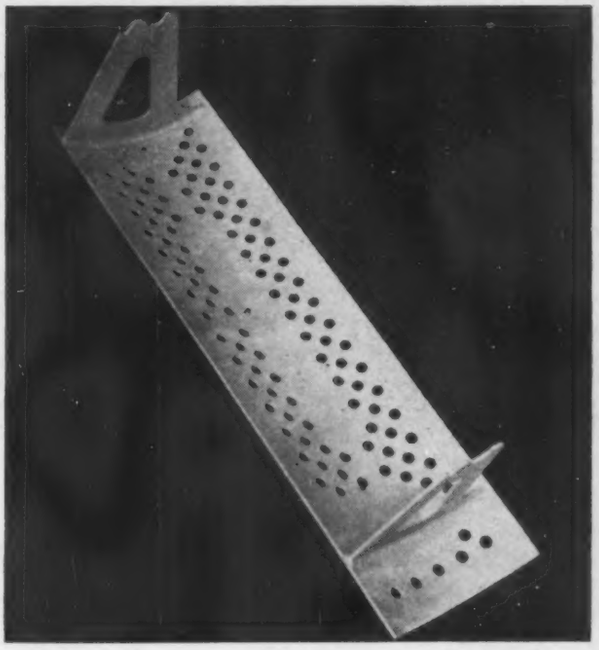
CURRENT FLOW, indicated by arrows, passes from edge of hole radially through surrounding areas producing greatest temperature where severest forming will occur. Bottom electrode holder is raised ⅜ in. off the bottom ledge by a steel coil spring. It takes 85-lb. pressure to compress the spring, tripping a Micro Switch and starting current flow, which lasts 0.05 to 1.00 sec.



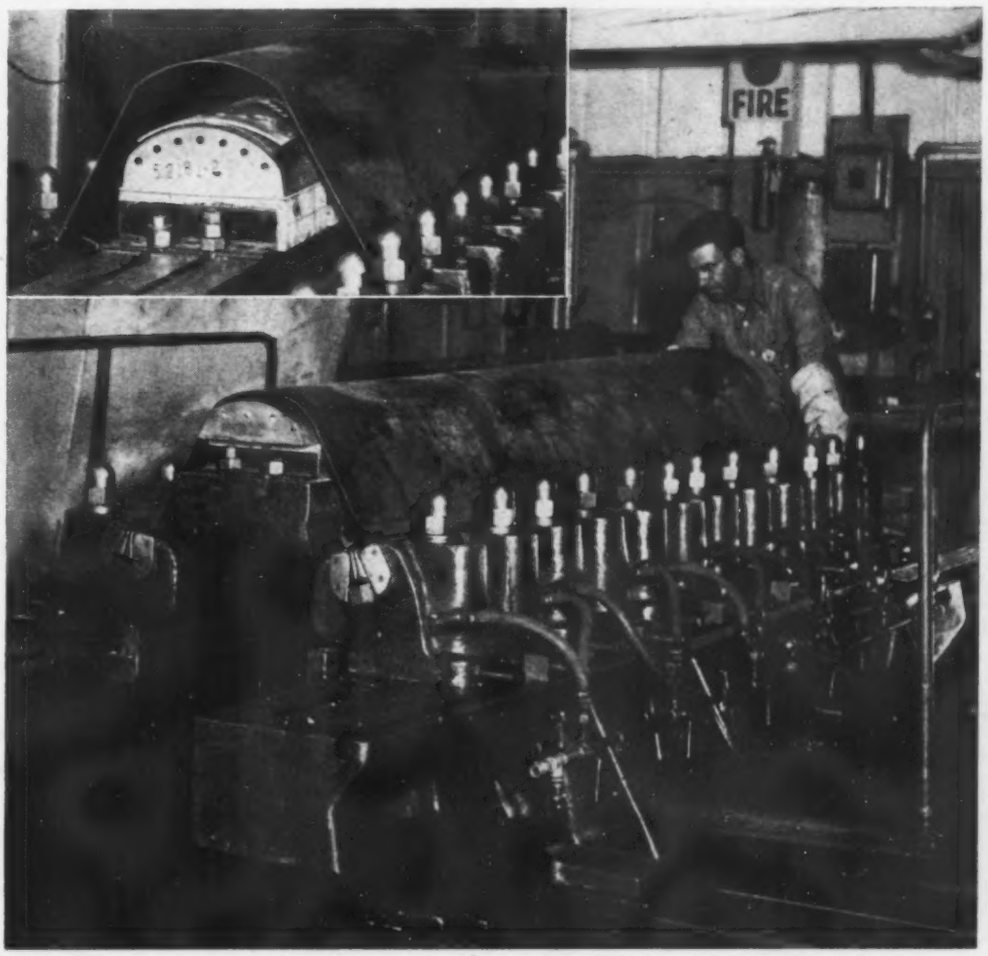
DIMPLING EQUIPMENT with resistance heating mounts electrodes in Chicago Pneumatic compression squeezer. Spotweld transformer has 16 settings ranging from 2000 to 5000 amp. Electrodes (right) have ⅜-in. holes for water cooling. Tool-steel dimple die and punch are seated in electrodes



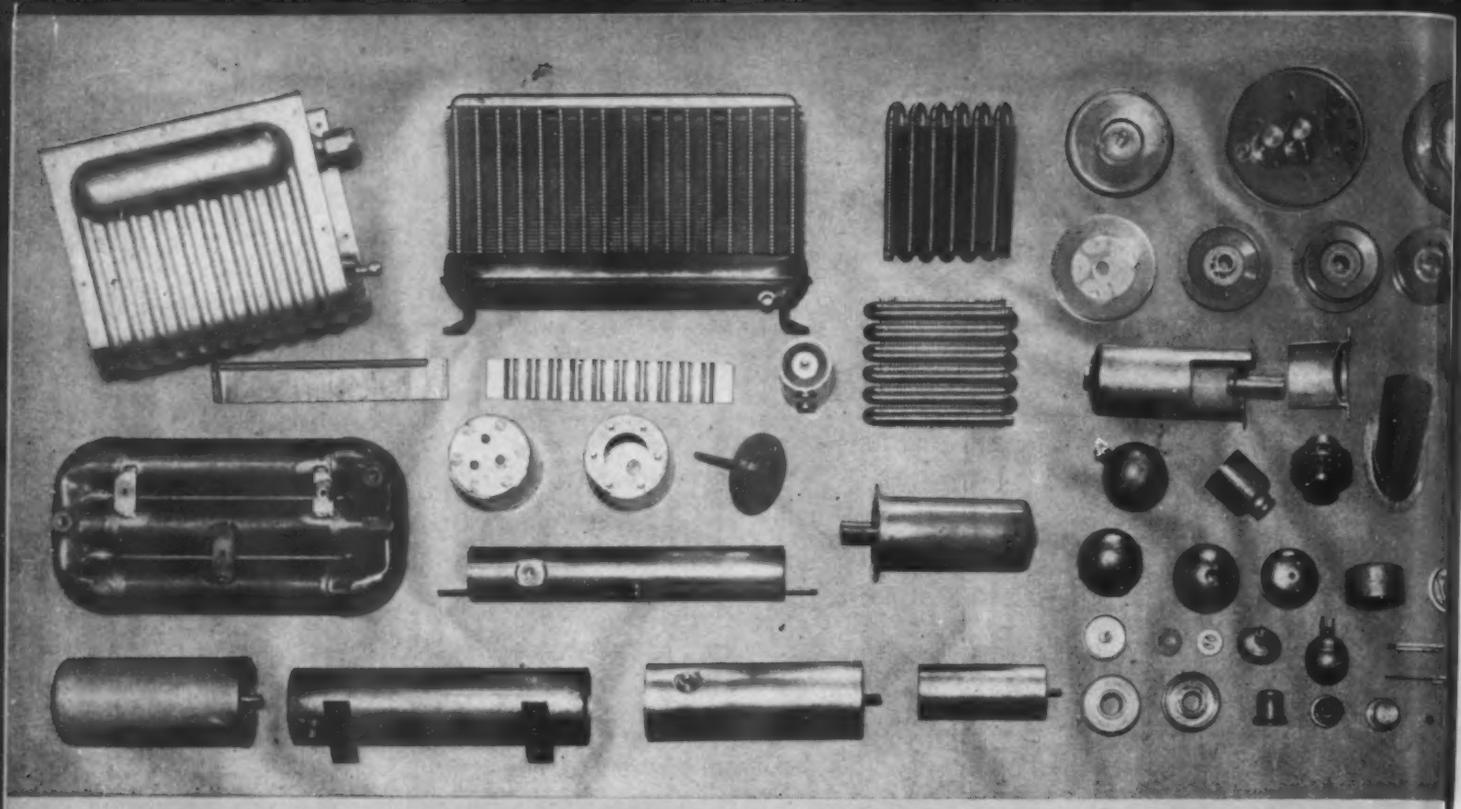
CONTROL OF DIMPLING HEAD. Die and punch in contact with the sheet travel down, tripping Micro Switch through the actuating arm so metal is heated before lower electrode strikes the ledge and the metal is shaped. Knob varies pressure at time of trip by causing the cam to move plate on which switch is mounted



SPOILER with supporting brackets welded in place. Originally cold-formed on a press brake with standard V-dies, the part had to be stress relieved, had poor contour and physical properties, with rejection as high is 20%. New hot-forming process saved more than $43,000



BLANKS of JS-1h are cut to size, drilled and finished before forming which simplifies fixtures and reduces cost. Blank is heated to 425° F. in a hot-air furnace, then formed on a Kirksite die by a mild-steel strap held in an Erco stretch press. The die is heated by electric resistance units to 450° F. Inset shows blank after hot forming. Process takes 6 min., requires two men to handle the work and one to operate the stretch press. The die "over forms" the work so that after springback it is the proper shape



Range of assemblies that can be handled economically in furnace brazing is from small radio tubes to large aircraft, automotive and refrigerator units. The process becomes most economically practical where multiple-junction points are involved in an assembly

CONTINUOUS FURNACE BRAZING . . 2

How to Select and Apply Brazing Media

Methods analysis for brazing saves time, money and material by ensuring proper application of media, heat and equipment

BY C. L. WEST
VICE-PRESIDENT, THE ELECTRIC FURNACE COMPANY

CHOICE of a brazing medium usually depends on composition of the parent metals in the assembly and their temperature limitations. The proper brazing medium should melt and flow freely at a temperature lower than the melting point of the parent metal, should be of a type which will freely wet the surfaces and so placed that it will creep through joints to be united.

The brazing medium may be in any of a number of forms, including wire ring, foil, slugs, electroplating or powder. Copper, because of its constant melting temperature, is easily utilized in any of the above forms. Brass, silver solders and other compositions containing zinc can be used in the form of wire, foil or slugs with fluxes but are not practical in powder form because of the rapid distillation of zinc from powder at elevated temperatures.

The brazing medium should generally be applied adjacent to the junction of the parts to be joined and in contact with both. In some assemblies, parts are grooved to hold the brazing medium securely. Brazing media should not be located between the parts to be joined except where the latter are free to move in a vertical position by gravity, or in a variation of this arrangement in which weights push the parts together during brazing. The brazing medium flows into joints because of capillarity, and any voids between joints will remain void in the brazing operation.

Widest application of furnace brazing is to steel assemblies, in which copper is frequently used for brazing because it does not require a flux and gives strong, clean joints.

Some alloying constituents in steel, such as chromium, manganese, silicon, vanadium and aluminum, tend to form selective oxides when exposed to impurities in a furnace atmosphere at elevated temperatures, and these oxides are only reduced by means of a solvent flux. When the constituents named total in excess of 1 or 2% of the parent metal, a flux is usually necessary to allow the brazing medium to creep through the joints.

In brazing steel assemblies, brass in the form of wire, foil or slugs, with a composition of approximately 60% copper and 40% zinc, is used rather extensively. This melts at a temperature in the neighborhood of

1600 F. as compared with 1981 F. for pure copper, and normally flows freely, wetting the surfaces of steel and iron parts at a temperature of 1750 F. when properly applied with necessary flux.

Usual practice is to dip the brass brazing medium into a flux solution, in which it takes on a thin coating similar in consistency to lacquer. This coating prevents distillation of zinc from the brass until the assembly reaches the temperature at which it will flow freely, at which time the coating bursts, allowing the zinc to vaporize and pass off with the furnace atmosphere and the residual copper to wet the surfaces and flow through the joints, providing for an average strength of joint equivalent to that obtained in copper brazing.

Lower Temperatures Useful

Advantages of brass as a brazing medium come from lower operating temperature on materials which can not practically be heated to the temperature required for copper brazing, and where cast iron is joined to steel parts wherein the lower brazing temperature retards growth of the iron as well as absorption of the brazing medium by the iron. The lower operating temperature reduces maintenance cost for the furnace in use, and particularly for the heat-resisting alloy parts within the heating chamber.

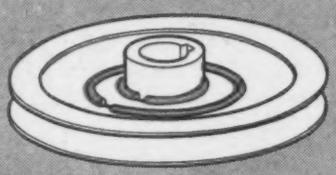
The disadvantage of using brass as a brazing medium, plus necessary flux, lies in the fact that the flux forms small glass beads around each joint. These must be dissolved in a hot lye solution.

A flux for brass brazing is made from four parts borax and one part anhydrous borax, dissolved in a suitable quantity of hot water, the solution being allowed to boil until it becomes of tacky consistency, similar to lacquer. It is then maintained at a temperature of approximately 180 F., adding water as required until a batch of flux is used up. Brass-wire rings, slugs and foil are dipped into this type of flux solution before application to the assembly to be brazed.

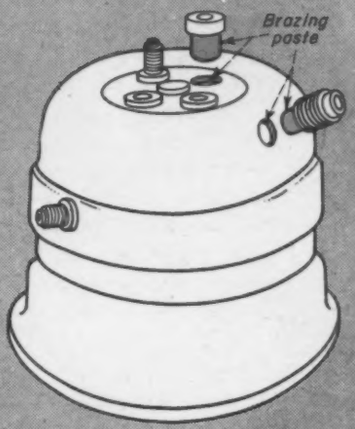
An alloy of phosphorus and copper, known as phos-copper, and an alloy of copper, silver and phosphorus, known as sil-phos, are self-fluxing when used on copper and flow freely at low temperatures in the neighborhood of 1580 F. When these brazing media are used for brazing brass or bronze, a flux is necessary.

These brazing alloys are recommended for nonferrous parent

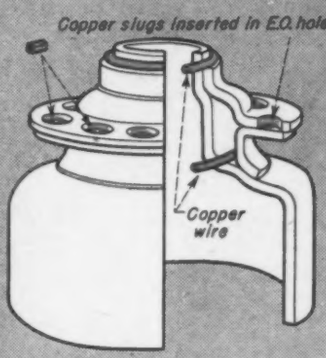
BRAZING MEDIA APPLICATION



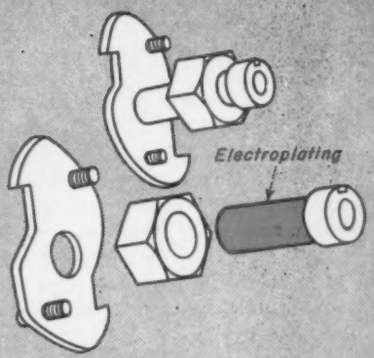
WIRE.. Brazing media in wire form are most widely used for furnace and other brazing processes, being the easiest form for ready and controllable application



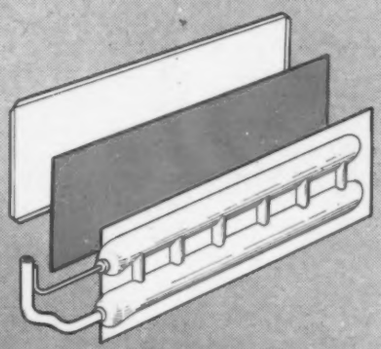
PASTE.. Copper powder is frequently used as a paste, with lacquer and thinner, where it is difficult to make other forms of brazing media adhere and retain their position in assembly during the furnace brazing operation



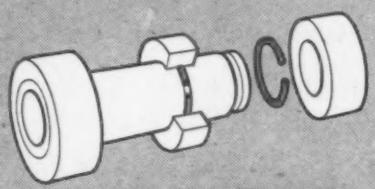
SLUGS.. Brazing slugs, made by punching from sheets of brazing material, are suitable for this type of assembly, where a flow by other forms would be rather difficult



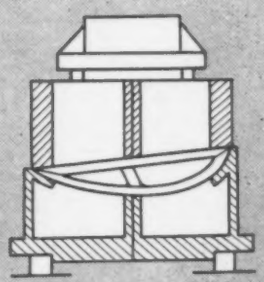
ELECTROPLATING.. Junction points in some assemblies may be electroplated with brazing media, which melt in the later furnace operation to supply the bond



FOIL.. Flat sections in assembly are adequately joined by using a foil or thin strip of the brazing medium



GROOVES.. Range of assemblies that can be handled is broadened by the use of grooves for holding the brazing media, usually in the form of rings, securely and in a position to provide flow



DIES.. Brazing media may be placed between parts to be joined, as in this hollow steel propeller, if provision is made to force the parts together. The assemblies are placed between heavy top and bottom dies conforming to the blade contour and charged into the furnace

TEMPERATURE CONDITIONS FOR BRAZING MEDIA

***COPPER**—Furnace control temperatures for copper brazing usually range from 2000 to 2100 F., depending on materials involved and final results to be obtained*

***BRASS**—Temperature control for brass brazing media ranges from 1700 to 2000 F., the lower temperatures causing the metal to flow freely and the higher temperature being used as a gradient for increasing production. Regardless of temperature gradient, assemblies of steel parts need not be raised above 1750 F.*

***PHOS-COPPER**—This alloy melts freely at 1380 F. but temperature gradients up to 1550 F. speed brazing. Flow point is about 1525 F. for ribbon types of the alloy, and temperature gradients to 1650 F. may be used*

***SIL-PHOS**—Temperature gradients from 1400 to 1550 F. may be used with short-time elements on the furnace, melting point being 1300 F.*

***EASY-FLO**—Furnace temperatures from 1250 to 1400 F. will give rapid heating (melting point, 1175 F.)*

metals such as copper, brass and bronze, in which they provide a strong joint, but they are not suitable for ferrous metals because the iron phosphide formed by the iron and phosphorus is extremely weak and brittle.

An alloy of copper, silver, zinc and cadmium, known as Easy-Flo silver solder, is the lowest-melting-point silver brazing alloy available, and is suitable for brazing either ferrous or nonferrous metal assemblies. It contains an appreciable amount of zinc, so is practically always used with a flux and has a number of the same characteristics in regard to distillation of zinc as previously described for brass. Therefore, the flux assures thorough wetting and flow.

Silver solder, such as the Easy-Flo type, having a melting point of 1175 F., is commonly used in joining metals (i.e., nonferrous) which will not withstand elevated furnace temperatures, and in brazing cast-iron and stainless-steel with a flux.

In a few instances, high-melting-point brazing alloys (instead of copper or others mentioned above) are sometimes used in brazing steel, such as 95% copper, iron-nickel; 85% copper, 10% nickel, 5% iron; 97% copper, 3% cobalt; and copper, nickel and zinc composition.

Nominal tolerances are satisfactory for copper-brazed assemblies. When steel parts are brazed with copper, metal-to-metal fits should be snug, both for optimum strength and tightness in joints and to prevent movement of parts during travel of the assembly through the furnace.

There is no actual limit to tightness of joints where copper brazing is used on steel assemblies, but increased tightness generally requires increased time in the heat to permit the copper to flow clear through. Extreme tightness is, of course, objectionable because of the tendency to stress and distort parts.

Brazing Limits

The most satisfactory limits for copper-brazing steel assemblies are to use a maximum permissible press fit of approximately 0.001 in. per inch of dia., and for the other extreme a maximum gap in the joint of 0.0005 in. per inch of diameter. Compromises possibly should be made in the direction of heavier fits instead of larger gaps in order to render the assemblies self-sustaining during their travel through the furnace.

When brazing with lower melting alloys it is usually desirable to have a small clearance within the joint, ranging from 0.001 in. to 0.003 in. to permit the best flow of the brazing metal.

Surfaces to be wetted with the brazing medium should be reasonably clean and the brazing medium should be coated with the selected flux where fluxes are necessary, the actual arrangement being determined by study of each individual item.

For thorough wetting, all parts should be reasonably clean before assembly. A light film of oil which volatilizes easily without leaving any heavy carbon deposit will not prevent good brazing action.

Lead-bearing lubricants retard wetting action of the brazing medium and tend to produce a weak joint. The lead also reacts on the heat-resisting alloy parts in the furnace and reduces their service.

Any oxides on the surfaces of the parts at the joints should be removed by pickling before assembly. Any heavy oxide adjacent to or in a joint will reduce in the furnace atmosphere and absorb copper and reduce the strength of the joint.

Strength of Brazed Joints

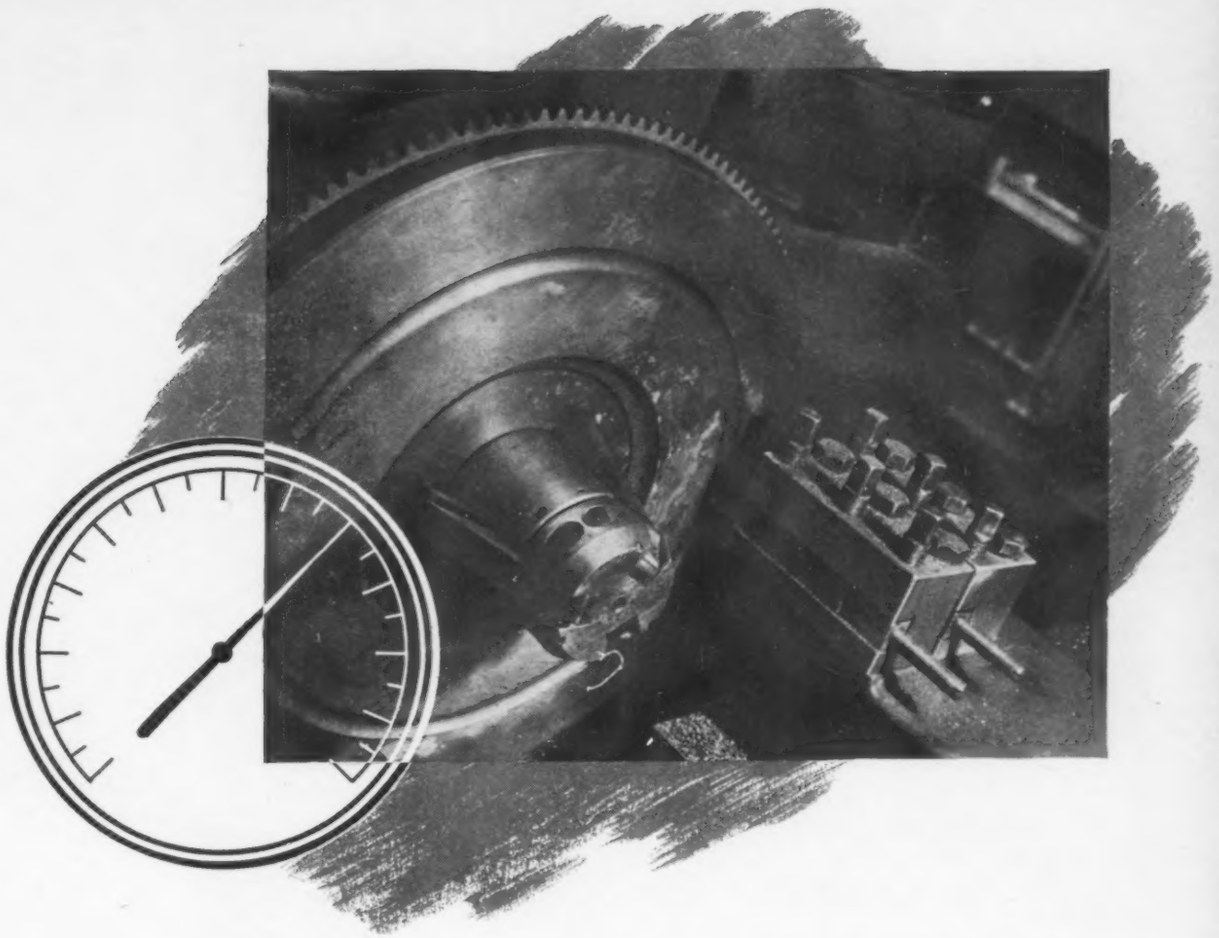
Shear strength of brazed joints in steel assemblies where copper is the brazing medium normally range from 27,000 psi. up to 3,000 psi. with most ideal manufacturing tolerances, and as low as 22,000 psi. where a joint is brazed with considerable gap, all of which compares with the shear strength of low-carbon steel at 33,000 lb. (after heating to the same temperature) and the shear strength of copper at 20,000 lb.

As copper enters and flows through a joint in a steel assembly, the copper surrounds the grain boundaries in the steel within the joint, forming an alloy. S.A.E. 4320 in the normalized state, when copper brazed, will develop a materially higher shear strength in the joint than that produced from high-carbon steel.

Tests in quenching copper-brazed steel assemblies indicate a reduction in the strength of copper-brazed joints to a small extent, the amount of reduction being relative to the degree of shock given the samples upon entering the heating and the quenching medium, particularly the latter. The values from a water quench are generally lower than those from an oil quench, but in spite of this relative weakness, copper-brazed assemblies are still much stronger than assemblies made by pinning or riveting.

Numerous tests have been made to determine the strength of furnace-brazed joints using silver brazing alloys and phosphorus-copper alloys, 25,000 psi. shear being usually considered a conservative ultimate value for calculations. Considerably higher strength can be obtained under most favorable conditions with expert operation of the brazing equipment.

In certain cases, the parts have been carburized before forming into an assembly and copper-plated to prevent decarburization during brazing. A more suitable arrangement is to utilize a furnace atmosphere which will minimize decarburization of the parts. By far the most satisfactory arrangement is to braze in advance of carburizing.



Brinell Hardness

Does NOT Measure Machinability

BY DR. ING. GEORG SCHLESINGER, CONSULTING ENGINEER

MOST production engineers have a maid-of-all-work, Brinell hardness, that they use indiscriminately for a variety of jobs. They use it correctly as a rough measure of tensile strength. But they use it incorrectly as a measure of machinability and wear resistance. For these important characteristics, Brinell hardness does not give results that can be depended on, that can be used as precise data on which to plan and execute production. In answer to the question, "What can one do with the machinability index in the shop that cannot be done with Brinell hardness as well?", Dr. Schlesinger presents here the results of reliable tests made in the United States, Europe and Great Britain. The accumulated data on material, Brinell hardness, cutting speed, tool life, power consumption and specific cutting resistance show the true status of Brinell as a criterion of machinability

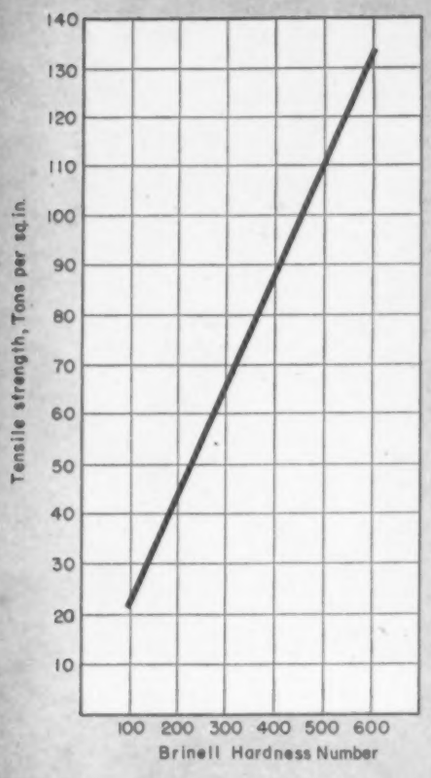


FIG. 1—Conversion from Brinell hardness to tensile strength gives an approximate relation, useful for rough estimates but not indicative of wear

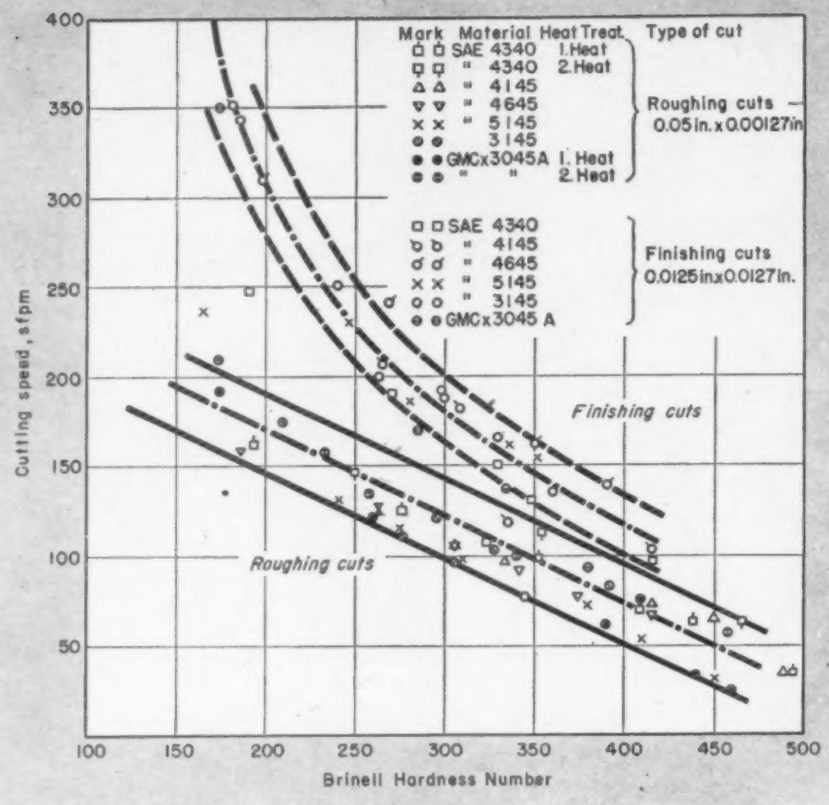


FIG. 2—Results of tests by Boston and Colwell on the effect of hardness on machinability of six alloy steels show the higher cutting speeds permissible on finishing cuts as compared to roughing cuts on materials of the same Brinell hardness

HARDNESS TESTS on structural material (rolled steel) are usually taken to indicate quickly and cheaply its probable tensile strength. Care must be taken that hardness measurements are such that a direct conversion is permissible. Tensile tests, as absolute measurements, yield values calculated from proved physical laws as follows:

(1) Elastic limit,
(2) Yield stress,
(3) Proof stress,
(4) Maximum stress,
(5) Percent elongation,
(6) Percent reduction of area,
(7) Modulus of elasticity.

Every designer knows that the Brinell test gives only an approximate relation to proof or maximum stress, and that it does not give any indication to the elastic limit, elongation and the modulus of elasticity. But for a rough estimate the Brinell hardness (B.h.) converted to tensile strength (Fig. 1) of rolled material is a useful parameter.

Even for resistance to wear, especially of cast iron, it shall be proved, however, that the B.h. does not give reliable values, either for the presumable wear of guides, such as on beds, carriages and uprights of machine tools, or for the machinability of castings.

For a real tensile-strength test, a special test piece of standard shape must be made from the bar, forging or casting; this is always expensive and sometimes, as with a casting, not possible at all. The Brinell test has here the great advantage that the workpiece is not destroyed. Indentures can be so arranged that they do not affect utility of workpiece, and are quickly made.

Hardness Is Not Uniform

As Brinell tests are made on the external skin of the piece, several tests must be averaged and materials of large diameter must be assumed to be uniform down to the core. But as this is not always so, a flat disk of the large roll may be cut and Brinell tests made from outside to the core.

In latter years there has been a trend to use of the Brinell test as a basis also for machinability—particularly in making approximate conclusions on tool life and even for the probable surface quality.

Meaning of the word "machinability" is not yet clearly defined. Some American authors combine true machinability, tool life and surface finish, while others combine tool life and Brinell hardness. On the Continent the cutting resistance of the material against the tool is considered a reliable basis, with only one variable being measured: the machining factor, a well-defined criterion, giving with the same reading the specific power consumption of the machine and the amount of material removed in cubic inches per horsepower per minute. Then either at the same time or by a subsequent process, tool life is determined by failure of the cutting edge, worn by the now known material, using a standard cutting speed of 60 min. (v_{60}) as criterion.

In Great Britain similar tests were made from 1940 to 1944 in the research department of Production Engineers (Loughborough, England) using the 3-component dy-

namometer[1] (Schiess-Siemens) as the measuring instrument. On the basis of these results, a one-component dynamometer[2] was later developed (1946) to simplify the apparatus without reducing the value of results for workshop use.

We will now discuss the results of reliable tests made in the United States, on the Continent and in Great Britain, all of which give the necessary data on material, Brinell hardness, cutting speed, tool life (v_{10} to v_{60}) and relative power consumption per cubic inch per minute and some of which give also the specific cutting resistance.

This will be the simplest way to decide the question, if Brinell hardness can perform or even be used as a fair substitute as the criterion of machinability of materials: (1) for rolled ordinary steels and alloy steels; (2) for cast iron.

Boston—Colwell Tests

Professors Boston and Colwell[3/4] of the University of Michigan made tests (1942) on the effect of hardness on the machinability of six alloy steels. Tool-life investigations of the six steels were made in mill-annealed, quenched and tempered condition.

Tool material, tool shape, size of cut and cutting fluid represented commercial practice. The results (Fig. 2) are plotted: (1) cutting speed (sfpm.) versus tool life (min.) and (2) cutting speed versus Brinell hardness.

The given figures of Brinell hardness, corresponding to v_{10} (tool failure after 10-min. tests) were used as basis of the discussion and conclusions.

Data:

1. Tool material: 18-4-2 H.S.S.
2. Size of cut:
   (a) Roughing—0.05 in. deep × 0.0127-in. feed per rev. = 0.00635 sq.in.
   (b) Finishing—0.0125 in. deep × 0.0127-in. feed per rev. = 0.000159 sq.in.
3. Tool shape:

Back rake	8°
Side rake	14°
Front relief angle	6°
Side relief angle	6°
End cutting angle	6°
Side cutting angle	15°

   Nose radius 3/64 in. (0.0468 in. = 1.191 mm.)
4. Coolant: Soluble oil 1:20 dilution; temperature maintained between 100 to 110 F. by thermostat; volume about 3 gpm.

Tool angles were ground correct to within 20 min. of specified angles, and nose radius to within 0.002 in. through the aid of special fixtures that gave the required accuracy.

Test bars, 1⅞ in. in dia. and 30 in. long, were oil-quenched from 1525 F. and tempered to yield nominal hardnesses from 250 to 500 Brinell; in reality the B.h.n. varied from 163 to 492.

Bars were rough turned to a depth of 0.03 in. to remove scale and any decarburized material. Brinell hardness tests were supplemented by Rockwell hardness surveys on cross-sections of disks cut from the bars.

This is excellent preparation of the test material, and the tools and plotted results prove the carefulness of the well reputed investigators.

Because these tests were made to show the marked sensitivity of machinability, characterized by tool life in minutes, without reference to surface finish, power consumption and cutting resistance, the hardness in measured B.h. should have determined the cutting speed unequivocally. A life of 10 min. (v_{10} speed) was preferred by the authors. This short testing time shortens the total time spent for such a long series of tests.

Machinability Correlation

As the Brinell hardness number is to establish the correlation of machinability (tool life in minutes per cutting speed in surface feet per minute) with the hardness of e.g. alloy steels, the general conception of the purchaser of steel, the steel mill as supplier, and the workshop as user is that to each hardness number one speed is correlated—within certain limits, of course, say ± 5% for Brinell hardness and ± 10% for cutting speed. But the effect of heat-treatment, if mill-annealed, 1 and 2 heat, or quenched and tempered, is contained in the increase of Brinell hardness and consequently the corresponding reduction of cutting speed (v_{10}) for the same tool life.

Fig. 2 shows the well-known fact that the plotted points of the finishing cuts (0.0125 in. × 0.0127 in.) form a hyperbola with much higher permissible speeds than the points of the roughing cuts (0.050 in. × 0.012 in.) for the same Brinell hardness number.

Tables I a to f for soft (B.h.n. = 163-186), semi-hard (249-310) and hard (345-410-488) materials reveal better than do the plotted curves the enormous speed differences by numerical values. For about ± 1-5% Brinell difference against the average values (175-260-300-360-424-465), we have between 20 and 60% speed difference, which will puzzle the shop, if it works to Brinell hardness as a criterion for speed. If we concentrate the comparison tables to roughing cuts only for hard materials between 296 and 488 Brinell, we observe (c to f) that the correlation of B.h.n. to speed is neither uniform nor comparable in range. GMC-x 3045A with Brinell 460 allows v_{10} = 24 sfpm., and SAE 4340 with 465 Brinell, a bit harder, allows v_{10} = 61.5, which is 250% more. GMC-x 3045A with 345 Brinell requires 77.5 sfpm., whereas the harder steel SAE 4340 with 356 Brinell allows 114 sfpm. which is 148% higher.

In the discussion of Boston and Colwell's paper, two engineers of the Hoover Ball Bearing Co., Ann Arbor, Mich., gave a correct explanation of the large variations: "Our experience in machining mill-annealed 52100, 3140 and 2340 steels indicates that hardness measurements alone do not determine the machinability of steel. Two parts of the same bar of 52100 steel having identical hardness values differ greatly in machinability because of completeness of spheroidization or presence of lamellar pearlite. Similarly we have had better machinability results on normalized 3140 and 2340 steels than on annealed bars, although the hardnesses have been identical. We believe these differences to be due to the microstructure."

Merchant—Zlatin Tests

Another proof[5] of the unfitness of the Brinell hardness for special steels, recently developed to facilitate machining, was presented by E. Merchant and N. Zlatin before the Metal Cutting Section at the 1946 annual meeting of the American Society of Mechanical Engineers.

Table II, taken from this publication, shows the material, its condition, the Brinell hardness and the measured cutting speed v_{60} for 60 min. Here the pretended rule, high Brinell hardness requires low speed and low Brinell hardness allows high speed, is just reversed for six materials, refuting again the Brinell criterion.

The table proves: (1) Type 304 (stainless steel 18-8) with a low Brinell hardness (139) requires 30% less speed (70-90 sfpm.) than stainless type 303 (18-8) with a

TABLE I—BRINELL HARDNESS AND TOOL LIFE

Cutting speed rough test with chip cross-section of 0.050 in. deep x 0.0127-in. feed on alloy steels of different hardnesses

(Boston and Colwell[3])

	Material	Brinell Hardness Number	Cutting Speed for Tool Life v_{15} sfpm.	Average Brinell Hardness	Max. Difference of v_{15} per cent
	SAE 5145	163	236		
	GMC-x3045A	174	192		
a	SAE 3145	175	192	175±5%	33
	SAE 4145	176	192		
	SAE 4645	186	159		
	SAE 4340	249	147		
	SAE 3145	258	134		
	GMC-x3045A	260	121		
b	SAE 4145	263	123	260±4%	25
	SAE 4645	263	126		
	GMC-x3045A	275	111		
	SAE 5145	275	114.5		
	SAE 3145	296	119.5		
	SAE 4145	305	105		
c	SAE 4645	305	108	300±3%	20
	GMC-x3045A	308	95.5		
	SAE 5145	310	96		
	GMC-x3045A	345	77.5		
	SAE 4645	342	92		
d	SAE 4340	357	99	360±5%	37
	SAE 4340	356	114		
	SAE 4645	375	78.5		
	SAE 5145	380	71		
	SAE 5145	410	52		
	SAE 4340	410	69.5		
e	SAE 3145	410	75	412±1%	30
	SAE 4645	415	68		
	SAE 4145	415	70.5		
	SAE 4145	450	63.5		
	SAE 5145	447	25		
f	GMC-x3045A	459	56	465±4%	62
	GMC-x3045A	460	24		
	SAE 4340	465	61.5		
	SAE 4145	488	32		

much higher Brinell of 162 (100 to 130 sfpm.) but produces a better surface finish. (2) The two steels A-8640 with approximately the same Brinell hardness (187 and 191) have 20% difference in the cutting speed (111 to 88 sfpm.), further increased by doubling the hours of tool life, both with the same inferior surface finish. (3) SAE 52100 cold-drawn with a Brinell of 235, which is considerably harder than SAE 52100 cold-drawn and annealed with a Brinell of 190, allows even a higher speed of 95 sfpm. against 84 sfpm., with the same fine surface finish.

Only for C-1022 and C-1019 the Brinell hardness corresponds approximately to the speed variation. The surface finish was improved with the higher cutting speed. This is logical, whereas it was reversed for types 303 and 304. My conclusion is: complete chaos from using Brinell hardness as basis for measurement of machinability.

In 1913 when I drew attention[4] to the unreliability of Brinell hardness as criterion for machining properties, I met with sharp criticism by prominent German, Austrian and Czechoslovakian steel works. An impartial answer was given by substituting the arbitrary Brinell hardness test by real cutting-resistance tests, then to determine the specific cutting force for different cross-sections of chip, from 0.0015 to 0.0093 sq.in. But it took 30 years of development until the delicate, complicated and expensive 3-component dynamometer with hydraulic, mechanical or electrical gages could be replaced with success by the simple, rigid and cheap one-component dynamometer with simple dial-gage readings.

Test Results on Ni-Cr Steels

The Research Department of Machine Tools and Tools of the Technical University, Berlin, published 1932-33 a thorough report[7] on 14 chrome-nickel alloy steels used mostly for automobiles and airplanes.

Table III gives the chemical analysis of four German (E: carburizing, V: normalized) and of ten American SAE chrome-nickel steels, and Table IV the results of heat-treatment, Brinell hardness number, type of tool, machinability index given as tangential force per 0.001 sq.in., relative tool life in surface feet per minute for a chip area of 0.0062 sq.in. measured for a life of 60 min. (v_{60}) and the metal removal factor $S = \frac{396}{T}$ cu.in. The specific tangential force per 0.001 sq.in. was here derived by measuring the total tangential force divided by 0.0062 sq.in. (4 sq.mm.).

The SAE steel bars were 8 in. in dia. x 80 in. in length, the EN and VCN bars 10 in. in dia. x 80 in. in length. They were turned down not smaller than 4 in. in dia. to avoid vibration and the influence of lack of uniformity. Cross-sections of the fairly heavy roughing cuts were:

Sq.in.	Sq.mm.	Depth in.	Feed in.
0.0031	2x1	0.156	0.04
0.0062	4x1	0.156	0.04
0.0093	6x1	0.20	0.04
0.0125	8x1	0.24	0.04

Some bars of 8-in. and 10-in. dia. showed differences of Brinell hardness from external diameter to the core, e.g. from 248 to 228, which increased the tool life unexpectedly up to 20%. Therefore, a portable Brinell press was adjusted on the wear support and hardness tests were repeated for each smaller diameter. I equipped a heavy lathe (60 hp.) in Loughborough (1943) with a similar instrument; uniformity of hardness was controlled by this simple arrangement.

These nickel and chrome-nickel steels have a similar microstructure and are distinguished only by varying percentages of C, Ni and Cr. It was to be expected that this case

TABLE II—COMPARISON OF BRINELL HARDNESS AND CUTTING SPEED
(Merchant & Zlatin[5])

No.	Material	Nominal Physical Properties: Condition	Brinell Hardness	Workhardenability Meyer n	Practical Machining Properties: Cutting Speed-sfpm. (Relative Tool Life)	Hp./cu in./min. (Relative Power Cons.) K	Surface Finish
1	Type 303 (Sulphur) (stainless steel)	annealed	162	2.37	100-130	0.94	20-30
2	Type 304 (stainless steel)	annealed	139	2.39	70-90	1.24	6-9
3	A-8640 steels (sulphite treated)	annealed and cold finished	187	2.30	111 (5 hrs. per grind)	1.11	65-85
4	plain	annealed and cold finished	191	2.30	88 (2½ hrs.)	1.16	65-85
5	C-1022 leaded	hot rolled	121	2.29	160-190	0.60	30-40
6	C-1019 (low-carbon mild steel) plain	hot rolled	147	2.20	120-140	0.90	60-70
7	SAE 52100 (steel tubing)	cold-drawn	235	2.12	95	1.08	6-7
8	SAE 52100	cold-drawn and annealed	190	2.33	85	1.15	6-7

would be favorable for the Brinell hardness criterion and that results for v_{60} might follow some law of Brinell approximately. However, the change in tool shape from B to S shows differences in cutting speeds, e.g. for EN 15 for the same Brinell hardness of 124 from $v_{60} = 156$ to 182 sfpm., about 16% which can never be derived from the unaltered Brinell hardness.

Failure of the tool (tool life) was measured by the sudden increase of all three cutting components,[4,7] visualized by pen records; the tangential force followed a few seconds after the rise of the back and feed force. Tool wear is difficult to measure, and the surface quality for such roughing cuts is of no importance.

Table IV (lower part) shows that all Brinell hardnesses of annealed materials are considerably lower (25 to 32%) than those of the normalized pieces of the same analysis. But the cutting speeds (tool life) for v_{60} do not follow consistently the Brinell hardness numbers, either for the annealed and normalized steels or for the soft carburizing steels of the upper part of the table; they vary from 0 to 10% as maximum. The same lack of lawful order has already been criticized in still greater extent for the corresponding values of Table I.

An investigation proved that the abrasiveness of the normalized steels of Table IV was considerably increased, a factor which must always be combined with the regular correlation of cutting resistance and permissible cutting speed for a chosen time (v_{60}). That the hardness test does not measure abrasiveness is best proved by Brinelling soft copper and soft, free-cutting stainless steels (Table II, type 304), which require rather low speeds in spite of very low Brinell hardness. This lack of correlation of Brinell hardness and cutting speed makes the hardness test unsatisfactory for rate

TABLE III—ANALYSIS OF TEST SPECIMENS
(H. Plagens, Technical University, Berlin[7])

Material*	Chemical Analysis: C %	Si %	Mn* %	P %	S %	Ni %	Cr %	Other Constituents
Carburizing Steels								
EN 15	0.15	0.27	0.53	0.015	0.025	1.51	0.32	—
ECN 35	0.14	0.33	0.51	0.015	0.030	3.60	0.89	—
SAE 4615	0.11	0.22	0.44	0.016	0.015	1.53	0.11	0.25 Mo 0.04 Cu
SAE 2512	0.13	0.23	0.48	0.015	0.018	5.04	0.10	0.05 Cu
SAE 2315	0.21	0.25	0.60	0.017	0.013	3.39	0.11	0.05 Cu
SAE 3312	0.12	0.29	0.46	0.014	0.015	3.36	1.53	0.06 Cu
Heat-treated steels								
VCN 15	0.35	0.38	0.72	0.02	0.025	1.36	0.70	—
VCN 35	0.36	0.38	0.59	0.02	0.031	3.18	0.89	—
SAE 3130	0.30	0.22	0.63	0.015	0.031	1.17	0.53	0.04 Cu
SAE 3240	0.40	0.26	0.48	0.015	0.026	1.66	1.11	0.04 Cu
SAE 5130	0.26	0.16	0.72	0.016	0.029	0.10	0.83	0.04 Cu
SAE 5150	0.51	0.20	0.74	0.015	0.025	0.11	0.92	0.04 Cu
SAE 6130	0.32	0.20	0.68	0.017	0.017	0.08	0.89	0.18 V 0.04 Cu
SAE 6150	0.46	0.19	0.70	0.015	0.025	0.07	0.83	0.17 V 0.04 Cu

*EN 15, ECN 35, VCN 35 and SAE 3312 are electric-furnace steels. Others are open-hearth steels.

fixing and for judging machinability.

The machinability index here measures the machinability of all materials according to their cutting resistance as the natural law for the critical cutting speed, including, of course, the effect of heat-treatment on the cutting resistance.

These remarkable results were published in 1934 as check tests of H. Klopstock's tests of 1926[8] and my tests[9] of 1928 made on nominally the same materials, but using partly another shape of tool (shape S) with side rake 20° against shape B with 12°. The considerable differences of cutting resistance using tool B or S accentuates the necessity to standardize (Ref. 2, p. 125) the shape of the tool according to material being tested.

In Fig. 3, representing the tests of Table IV, cutting speed is plotted both against Brinell hardness (left) and machinability index (right). The Brinell diagram is divided into three groups: (1) for the six soft carburizing, not heat-treated steels; (2) for the six soft annealed American alloy steels; (3) for the same six American steels but normalized, and for two normalized German steel (VCN, with 1.5 and 3.5 Ni).

The machinability-index diagram visualizes the striking contrast between Brinell hardness and machinability index, the latter showing a straight line for all 20 test series. Obviously, tool life is allocated from 41.5 sfpm. for hard material (SAE 3312) up to 182 sfpm. for the softest (EN 15), including abrasiveness, to the machinability index. The cutting tool was high-speed steel (18-4-1 + 5% cobalt) with a hardness of 58-60 Rockwell C.

3-Component Dynamometer Tests

In 1937, I verified the validity of the machinability index by another series of tests[10] made with a Schiess-Wallichs 3-component dynamometer with electric measuring devices. The material was soft steel of 32-tons per sq.in. tensile strength, twice annealed and very carefully cooled.

The result was a practically constant resistance for small and heavy cuts (Table V and Fig. 4—line No. 3a), giving a uniform machinability index for all chip cross-sections. This deviates from the ordinarily accepted rule that the index decreases somewhat with increasing chip area, caused by the decreasing influence of the tool nose with deeper cuts. Of the three mentioned forces (tangential, shank, feed), only the tangential force was divided by the varying cross-section of chip, resulting in the same average index of 242 ± 2%, which is very good indeed.

In Fig. 4 the specific tangential forces for materials are plotted against chip cross-sectional areas between 0.00078 sq.in. and 0.078 sq. in., the results of more than 10 years of test work. The specific pressure (T) as index is shown for 0.001 sq. in. and for 1 mm.

The power or kilowatts consumed by the machine are noted in the last column in Table V. Calculated values are obtained from the formula:

$$\text{kw.} = \frac{736}{1000} \times \frac{Tv}{33000\,n}$$

As for these tests the constant cutting speed $v = 72$ sfpm. and the efficiency factor n of 0.64 (fairly old machine) were used, the value of

$$\text{constant } C = \frac{736 \times 72}{1000 \times 33000 \times 0.64}$$

$= 0.0025$. We therefore have to multiply the values of T by 0.0025 to get the kilowatts consumed.

TABLE IV—TEST RESULTS ON CUTTING SPEED
Brinell Hardness and Machinability Index
(H. Plagens, Technical University, Berlin[7])

Material	Brinell Hardness of External Diameter		Type of Tool*	Machinability Index – Tangential Force in lb. per 0.001 sq.in.		Relative Tool Life (Chip Area of 0.0062 sq.in.– Cutting Speed v_{60} sfpm.)	Metal Removal Factor $S = \frac{396}{T}$
EN 15	124		B	225		156	1.76
	124		S	199		182	1.98
ECN 35	155		B	277		99	1.43
	155		S	267		102	1.48
SAE 4615	122		B	238		141	1.66
SAE 2512	159		S	263		122	1.51
SAE 2315	161		S	264		105	1.50
SAE 3312	276		B	321		41.5	1.24
	annealed	*normalized*		*annealed*	*normalized*		
VCN 15	–	237	B	–	305	55	1.47
VCN 35	–	293	B	–	318	45	1.25
SAE 3130	155	–	B	263	–	97	1.51
SAE 3130	–	205	S	–	270	–	1.47
SAE 3240	182	–	B	288	–	74	1.38
SAE 3240	–	250	S	–	305	61	1.30
SAE 5130	143	–	S	246	–	130	1.62
SAE 5130	–	205	S	–	267	105	1.48
SAE 5150	177	–	S	282	–	89	1.41
SAE 5150	–	248	S	–	310	59	1.28
SAE 6130	156	–	S	252	–	117	1.57
SAE 6130	–	208	S	–	276	102	1.44
SAE 6150	168	–	S	278	–	93	1.43
SAE 6150	–	244	S	–	302	62	1.31

*B—Tool: side rake 12°
S—Tool: side rake 20°

Furthermore an often used figure is the relative metal-removal factor in cu.in. per 1 hp. per min.

Let

A = chip cross-sectional area in sq. in.

N = power consumption (gross) in hp.

S = volume of metal removed in cu.in. per hp. per min.

P = total cutting resistance in lb.

T = specific tangential force (tangential component of P) in lb. per 0.001 sq.in.

v = cutting speed in in. per min.

n = efficiency factor of machine tool used.

Power consumption is: $N = \frac{P \times v}{33{,}000}$ hp., where v is in sfpm.

It was proved that $P = A \times T$, because the tangential force T = power component of P; further by introducing v in inches we must divide by 12 to get

$$N_{gross} = \frac{A \times T \times v}{12 \times 33000} = \frac{A \times T \times v}{396000}$$

$A \times v = S$ = Chip volume in cu.in. (A = sq.in.; v = in.)

T = lb. per 0.001 sq.in. (machinability index)

$$N_{gross} = \frac{S \times 1000\,T}{396000} = \frac{S \times T}{396}$$

For $N = 1$ hp., $1 = \frac{S \times T}{396}$, or

$$S = \frac{396}{T}$$

With an assumed average efficiency factor $n = 0.67$, $S_1 = \frac{264}{T}$ (net)

Tangential force T is directly measured as machinability index and read from the dial in lb. per 0.001 sq.in. Consequently, the relative chip removal S_1 in cu.in. per 1 hp. per min. can be printed directly below the corresponding figure of T as in Table VI.

Table VI shows that an aluminum alloy, for example, with $T = 50$ lb. per 0.001 sq.in. allows removal of about 7.92 (or 5.87) times the volume of metal than from a hard steel of $T = 400$ with $S = 0.99$ (or 0.66) per hp. per min.

Wear Resistance vs. Brinnell Hardness

Wear of cast-iron surfaces sliding on each other has been investigated and compared with both Brinell hardness and microstructure. At the same time, it was understood that these surfaces, such as cylinder liners and guide ways of machine

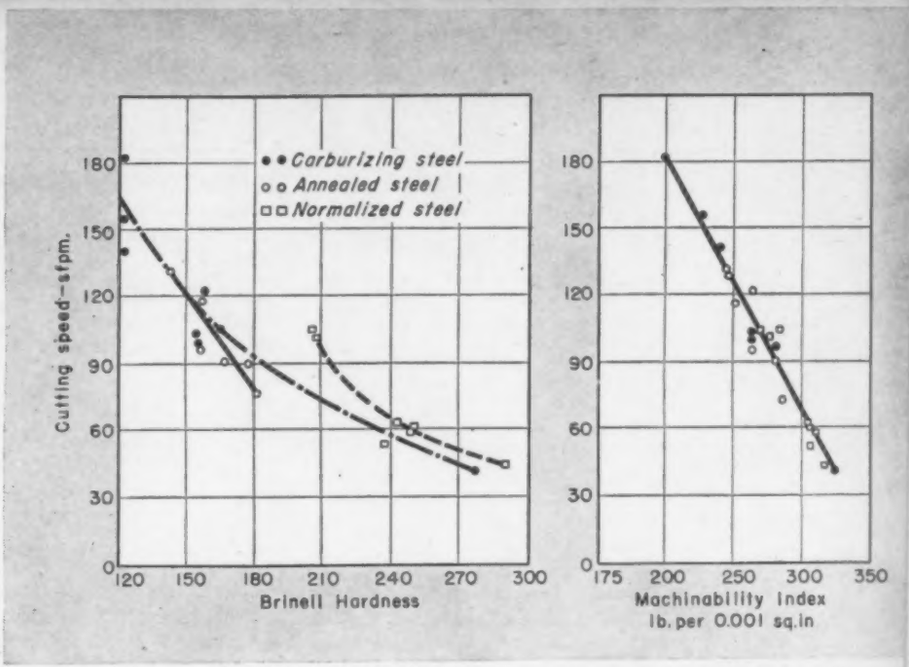


FIG. 3—Results of tests (Table IV) are plotted as cutting speeds against Brinell numbers and machinability indices, the latter giving a straight-line relation

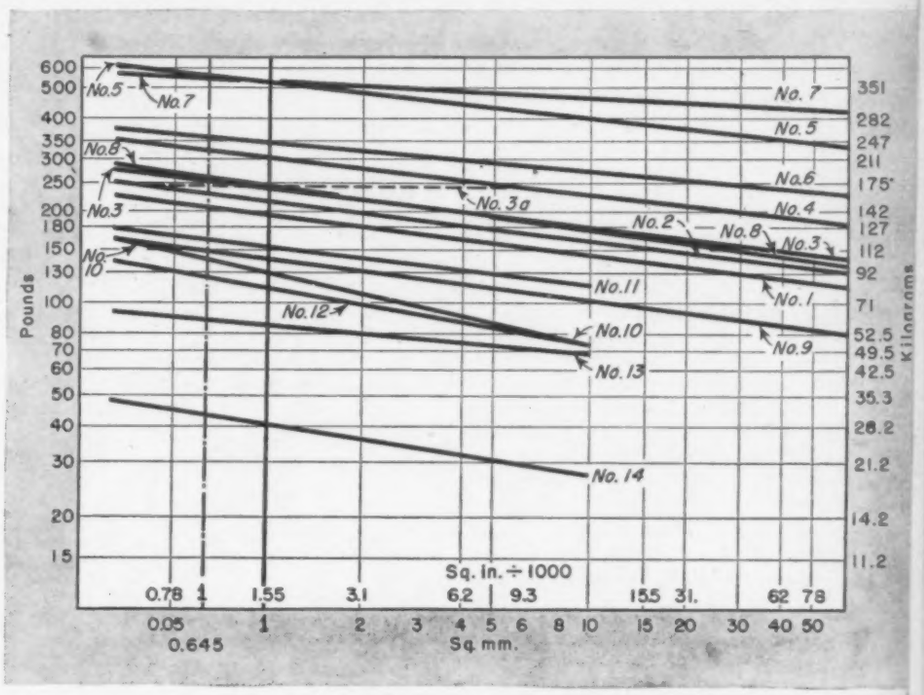


FIG. 4—Test results from Table V are plotted as tangential force against chip cross-sectional area in line No. 3a, giving a practically constant index, as compared to the usual decreasing index with increasing chip area as shown for the other results

No.	Material	Tensile Strength Tons per sq. inch
1	Steel	18-22
2	Steel	25-30
3	Steel	35-40
4	Steel	42-50
5	Hard cast steel	52-60
6	1.5 Ni-Cr steel	45-50
7	3.5 Ni-Cr steel	58-70
8	Steel casting	25-30
9	Gray iron	14-16
10	Brass	26
11	Bronze	34
12	Silumin	16-20
13	Aluminum (ext'd)	12-20
14	Elektron	14-20

TABLE V—TEST RESULTS ON CONSTANT MACHINABILITY INDEX
(Schlesinger[10]—1937)

Material	A Chip Area sq. in.	T Tangential Force lb.	R Radial Force lb.	F Feed Force lb.	$M=\frac{T}{A}$ Machinability Index lb. per 0.001 sq. in.	Kilowatt Dimand, kw.$=T \times v/C$ where $v=72$ sfpm.	
						Measured kw.	Calculated kw.
Mild steel — 32-tons/sq. in. tensile strength, annealed	0.0027	660	346	165	245	1.65	1.67
	0.0041	1002	474	286	245	2.64	2.52
	0.0055	1370	640	352	242	3.69	3.65
	0.0067	1650	748	394	245	4.13	4.15
	0.0093	2250	890	542	242	5.57	5.6
	0.0107	2520	980	638	235	6.3	6.3
					Average—242 ± 2%		

*Power balance: kilowatt (measured) = tangential force x cutting speed x efficiency of machine.[10]

tools, must be easily machinable by boring, milling, planing and scraping.

Carefully made tests proved that machinability of dense gray cast iron with Brinell hardness between 160 and 230 yielded about the same cutting resistance and required about the same cutting speeds, because microstructure, rather than increasing hardness, controlled the wear. But as for ordinary pearlitic gray cast iron the cutting resistance increased considerably above a Brinell hardness of 230, the cutting speed had to be reduced for the same tool life. A much better and more reliable criterion of machinability than the Brinell hardness was the drill test by Keep and Dalcher.[5]

TABLE VI

METAL-REMOVAL FACTOR AND MACHINABILITY INDEX

T lb. per 0.001 sq. in.	S_1 cu. in. per hp. per min.	S cu. in. per hp. per min.
50	5.87	7.92
100	2.64	3.96
150	1.76	2.67
200	1.32	1.98
250	1.055	1.585
300	0.88	1.32
350	0.754	1.13
400	0.66	0.99
450	0.586	0.88
500	0.528	0.792
550	0.48	0.72
600	0.44	0.66

In the last 20 years a considerable improvement in physical properties of cast iron was reached by developing nickel cast iron, the Pearlite and the Meehanite processes, to which the following observations are restricted. Here again the effects of both composition and microstructure are deciding factors for easy machinability for a wide range in Brinell hardness.

Wear resistance is generally examined by the wear test, using a rotating disk of special material (steel, cast iron or cemented carbide) against the surface of which (cylinder as in Fig. 5[11] or plane as in Fig. 6[12]) the test piece is pressed under a certain determined known pressure. Then the abraded material per hour is weighed by taking the weight of test piece before and after the testing time.

Example 1: Four piston-rings (Table VII) were turned and tested for wear by a flat cast-iron disk[12] with a Brinell hardness of 162. Hardness of rings varied from 206 to 240 and the analysis had little variations in C and Si. The wear measured by the abraded volume after 10 revolutions of disk with 1 kg. load and at 30 rpm. had large variations, but the cutting speed was exactly the same, about 300 sfpm., for the four rings.

TABLE VII—WEAR TESTS ON FOUR PISTON RINGS
(R. Zimmer[12])

Piston Ring No.	Brinell Hardness	Chemical Analysis – % (Remainder Fe)					Abrasion Vol. in cu. mm. ÷ 1000 against Flat Disk of 162 Brinell
		C	Si	Mn	P	S	
1	206	3.06	2.3	0.58	0.15	0.07	8.443
2	210	3.03	2.11	0.7	0.13	—	16.60
3	213	3.10	2.16	0.58	0.13	—	8.885
4	240	3.12	3.0	0.77	0.23	—	11.51

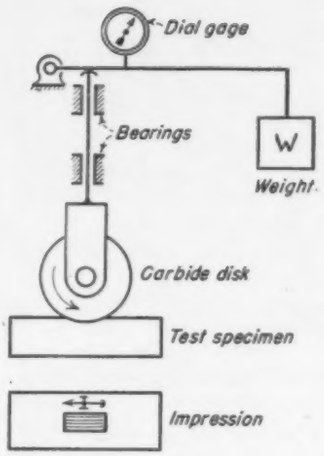
Wear of the softest ring (No. 1) with 206 Brinell was 8.443 gr., much less than that of the hardest (No. 4) with 240 Brinell with 11.51 gr. Here is no coincidence between hardness and wear.

Example 2[13]: Table VIII gives wear-test results on nine castings for cylinder blocks, piston rings, oil rings and cylinder liners. Brinell hardness varied between 162 and 240. Carbon, silicon, magnesium and phosphorus did not vary considerably; decisive were the contents of sulphur, nickel and chromium.

Wear resistance was measured on the flat disk (Fig. 6), made of the same cast iron as the cylinder casting with Brinell hardness of 162. The largest abrasion showed on the piston ring K2, and the smallest on the nickel-chrome casting NG, but the material ZG with Brinell hardness 162 showed less wear than ring K3 with Brinell hardness of 240.

Example 3: The Sawin[14] wear tester (Fig. 7) uses a disk of tungsten carbide (Widia) of 1.18 in. (30 mm.) and 0.1 in. width (2.5 mm.), which abrades an impression into the piece to be tested in about 5 min. Depth of impression is measured by an accurate dial gage (0.0005 in. per division) originating from the surface of the workpiece.

The volume which forms the abrading number is measured in 0.001 cu.mm. of the contents of the



Material tested	Vickers Hardness	Sawin Wear No.
Mn Steel, Heat-treated 75 tons per sq. in.	250	170
Cr-Ni Steel, heat-treated 75 tons per sq. in.	360	180
Spec. Cr-Ni Cast Iron	380	190
Cr-Ni Tool Steel, hardened	750	200
Cast Iron for machine tools	250	210
Al-Ni bronze, up to 50 tons per sq. in.	120	220
Steel, up to 45 tons per sq. in.	170	480

Fig. 7—The Sawin wear tester is equipped with a tungsten-carbide abrading disk and a dial gage for measuring impression depth. No correlation is shown in test results between Vickers hardness and wear resistance

impression. The disk turns at 675 rpm., making 3,000 revolutions per impression, which is about 0.002 in. deep, under a load of 15 kg. (33 lb.). As the impression is hardly visible and does not injure the surface of the specimen, this test can be made directly in the shop on any unimportant spot of the finished piece.

The tungsten-carbide disk abrades even hardened materials. Sawin gives therefore the Vickers hardness which coincides well enough, for workshop use, with the Brinell number. The test piece is cooled by a stream of suitable compound, which also carries away the chips formed under the disk.

The table in Fig. 7 shows that increasing wear numbers do not correspond at all to the various Vickers hardnesses. The hardened tool steel with 750 Vickers shows a higher wear number than cast iron with 250 Vickers. Steel of tensile strengths up to 45 tons per sq.in. with 170 Vickers has more than double the wear of aluminum bronze of 50-tons per sq.in. tensile with 120 Vickers. Again it is not possible to judge the resistance to wear by the Vickers (Brinell) hardness of different materials.

Example 4: Table IX shows the chemical analysis and the physical properties of Meehanite cast irons used in milling tests.[15] Fig. 8[16] shows the correlation of Brinell hardness and total volume of metal removed in cubic inches for cutting speeds of 1,150, 500 and 300 sfpm. of the C (Meehanite, 190-230 Brinell) and E (Meehanite, 176-240 Brinell) cast irons.

The Brinell numbers refer to averages taken across each test block. The carbon content of analysis E was slightly higher than that of an-

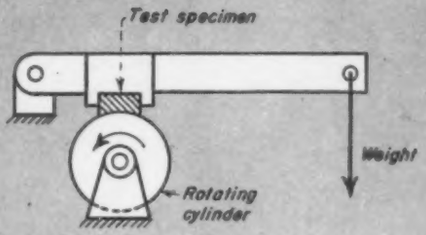


FIG. 5—Wear tests can be made by measuring the weight of material abraded per hour by rotating it against a cylindrical surface under a predetermined pressure applied on the beam

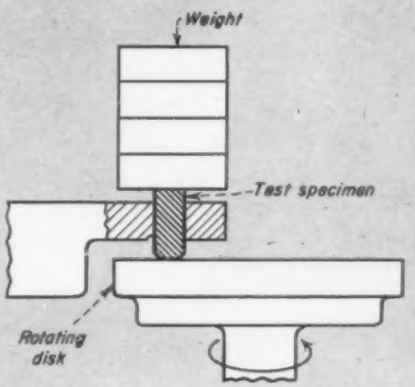


FIG. 6—A flat rotating disk of steel, cast iron or carbide can be used in place of a cylinder in making wear tests. As in the cylindrical tester, a predetermined pressure holds the test piece against the disk

TABLE VIII—BRINELL HARDNESS VS. WEAR RESISTANCE
(Waehlert[13])

Material		Brinell Hardness	Chemical Analysis – % (Remainder – Fe)							Abrasion Vol. in cu. mm. ÷ 1000 against Cylindrical Casting of 162 Brinell
			C	Si	Mn	P	S	Ni	Cr	
Cylinder casting	ZG	162	3.05	2.21	0.45	0.73	0.22	—	—	8.180
Piston ring	K4	206	3.06	2.3	0.58	0.15	0.07	—	—	7.400
Piston ring	K2	210	3.03	2.11	0.7	0.13	—	—	—	10.184
Graphite casting	L	210	3.12	1.97	0.65	0.53	0.032	0.09	0.045	7.614
Piston ring	K1	213	3.10	2.16	0.58	0.13	—	—	—	7.378
Oil ring	3a	220	3.10	2.2	0.7	0.2	—	—	—	8.910
Nickel cast-iron	1Ni	230	3.10	2.0	0.65	0.4	0.05	1.0	0.4	8.886
Ni-Cr casting	NG	235	—	—	—	0.5	—	0.1	0.04	6.756
Piston ring	K3	240	3.12	3.0	0.77	0.23	—	—	—	8.443

TABLE IX—PHYSICAL PROPERTIES AND CHEMICAL ANALYSIS OF MEEHANITE TEST SPECIMENS
(Field and Bullock[15] and Field and Stansbury[16])

Material	Average Brinell Hardness	Tensile Strength lb. per sq. in.	Chemical Analysis – %							
			Total C	Si	max. P	max. S	Mn	Cr	Cu	Mo
Meehanite:										
Type A	190	50000	2.85-3.15	1.20-1.50	0.12	0.2	0.8-1.2	—	—	—
Type C-304	220	45000	2.90-3.20	2.45-3.00	0.18	0.2	0.75-1.60	1.00	—	0.5
Type C-309	230	40000	2.90-3.20	1.60-1.85	0.18	0.2	0.75-1.00	1.25	3.00	—
Type E-3¼	176	36000	3.4	1.85	0.34	0.58	0.74	—	—	—
Type E-1¼	197	36000	3.36	1.82	0.31	0.20	0.70	—	—	—
Type E-¾	197	36000	3.38	1.74	0.35	0.19	0.72	—	—	—

TABLE X—TOOL-WEAR TESTS ON NI CAST IRON

Analysis				Brinell Hardness	Cutting Speed sfpm.	Feed per Rev. in.	Depth of Cut in.	Tool	Result
Ni %	Si %	Mn %	P %						
					46	0.016	0.04	18-4-1	destroyed in 1 min.
					80	0.02	0.04	Cemented Carbide	good
4.06	1.62	1.01	0.72	325	112	0.047	0.054	Cemented Carbide	good
					182	0.075	0.059	Cemented Carbide	dull after 5 rev.
4.69	1.60	0.98	0.72	348	60	0.075	0.034	Cemented Carbide	good
					182	0.075	0.034	Cemented Carbide	good

nealed C material. The graphite of E was coarser, but the pearlite-graphite size in some sections of the test bars were comparable.

The object of the investigation was to correlate the microstructure of various cast irons with their machinability, measured by:

1. Total volume of metal removed in cubic inches.
2. Cutting speed in sfpm., correlated to cutting time in minutes.

Cutting speeds varied between 200 and 1,200 sfpm., but the plotted results proved that, for a tool life of 60 min., all cutting speeds must be reduced below 300 sfpm. Only the iron E-3¼ allowed $v_{\infty} = 300$, while E-¾ and E-1½ caused tool failures at v_{∞} and v_{∞} respectively. Bar dimensions varied—¾, 1¼ and 3¼ in. thickness for the same width of 4½ in. and length of 20¼ in. The difference in thickness influenced the interlamellar spacing of the pearlite.

Tests were run on a Cincinnati Hydromatic milling machine. A single-tooth cutter, with a 500-lb. flywheel held at a 6-in. radius, was used for tool-life and surface-finish tests. The tooth had + 3° axial and radial rakes, a 30° corner angle and a + 4° resultant rake. In all cases, the cut was 3/16 in. deep, 6 in. wide and 20 in. long. Feed per tooth was 0.015 in. Carboloy 44A was employed as the carbide and all milling was done dry.

Tool life and power requirements were measured. As surface finish by profilometer readings varied between 80 and 230 microinches, they can be omitted as a criterion because surfaces above class 60 are rather rough and above class 12 μ, much too rough for mating parts of any running, transition and interference fits.

Fig. 8 shows the Brinell hardness plotted against volume of metal removed to produce 0.030-in. uniform (Fig. 9) wear of the tool edge along the carbide clearance land. The Brinell hardness of such material is indicated. Let us quote the evaluation[16] of Field and Stansbury, Cincinnati. "It is seen that at 1,150 sfpm. all the material from 240 to 175 Brinell had practically the same tool-life values. At 500 sfpm. the change in the tool life was again small over this same hardness range. However, at 300 sfpm. it is observed that there is a general increase of tool life with decrease of Brinell hardness, the relation being approximately linear in the region of 175 to 240 Brinell."

This statement contains the following clear facts:

1. For the range of 500 to 1,150 sfpm. for Meehanite cast irons from 240 to 175 Brinell, the Brinell hardness as criterion of tool life is eliminated. This range of hardness, however, covers the great majority of all ordinary castings, e.g. for machine-tool parts. This statement is valid just for those high cutting speeds for cast iron which characterize the modern trend of development using cutters with negative rakes.[17]

2. For a cutting speed of 300 sfpm. and less the Brinell hardness fits better to the obvious machining rule: harder material causes higher cutting resistance. Because the reduction of total volume removed is a simple consequence of the equation:

metal removal factor $S = \frac{396}{T}$, the

increased tangential force T automatically decreases S. Everybody in the workshop understands this, while the unreliability and arbitrariness of Brinell hardness regarding machinability, nil for 500 to 1,150 sfpm. but proportionate for 300 sfpm., could not be proved better than by the above mentioned impartial results. Vice versa, relatively large differences in machinability exist with ferrous castings which do not differ perceptibly in Brinell hardness.

The Meehanite Metal Corporation[10] recommends for machining the standard "GA" Meehanite cast iron a cutting speed of 450 to 500 sfpm. Examples of actual machining speeds and feeds using cemented-carbide tools are given:

1. 42-in. vertical boring mill, machining 29-in. dia. internal hoist gear at 450 sfpm. with ¼-in. depth of cut and 0.033-in. feed.

2. 18-in. engine lathe, machining 8-in. dia. pinion blank at 480 sfpm. with ¼-in. depth of cut and 0.015-in. feed.

Tests on Cast Iron

In 1926, I tested, with high-speed tools (18-4-1+5% Co) on planing machines, ordinary cast-iron parts of machine tools for which the pearlite-graphite sizes were not so strictly observed as in the Meehanite and Pearlite alloys of today, but the presence of the hard cementite (Fe_3C) was reduced to a minimum. Brinell hardness varied again from 160 to 250.

The tests were made to find reasonable rules for the best hardness of beds, stands, columns and other parts of machine tools, checked by the Brinell test and required by Russian inspectors. The tests were made with a 3-component dynamometer specially made for setup on a planer.

The result was that for Brinells from 160 to 230 the cutting resistance was only slightly increased and tool life, measured by the time of tool failure for the same cutting speed of about 70 sfpm., remained rather constant. But from 235 Brinell upwards, tool life fell almost suddenly to less than 10 min. with a much increased cutting force. Hardness limits were, therefore, stipulated as 200 ± 10% (between 180 to 220).

The foundries would have preferred 200 ± 15% (between 170 to 230), at that time already favoring pearlite castings.

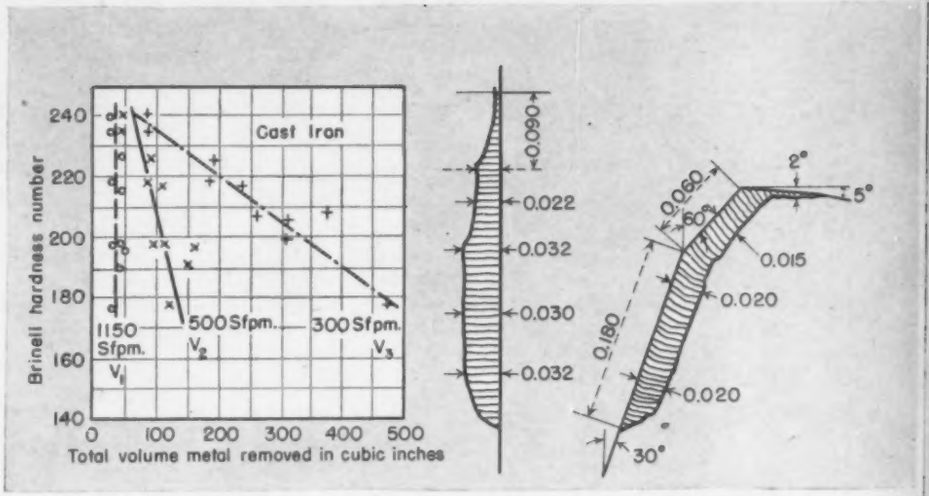


FIG. 8 — Correlation of Brinell hardness and metal removed to produce 0.030-in. tool wear shows that, at two higher speeds, Brinell hardness as a criterion is inaccurate

FIG. 9—Test results plotted in Fig. 8 were obtained by cutting until tool wear on the single-tooth cutter was uniform at 0.030 in. along the clearance land on the cutting edge

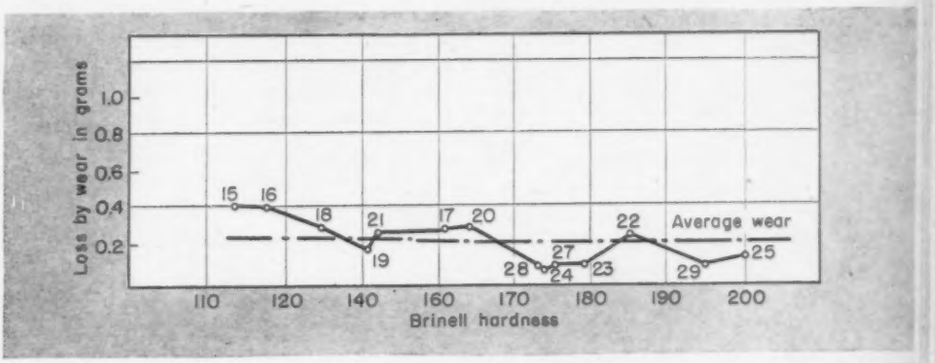


FIG. 10—Wear tests on nickel cast irons (Table XI) show that, for ordinary use, wear resistance is practically independent of Brinell hardness

Machinability and Microstructure

The evidence thus far accumulated indicates that the machinability of castings is related to metallurgical constituents which do not necessarily determine the average hardness. Nickel is another improving constituent of pearlitic cast iron, making it dense, hard but still well machinable.

Table X shows turning tests with nickel cast iron of very high hardness. Dull tools caused considerable work hardening on these austenitic cast irons. Tests[18] were extended to about 30 min. It is remarkable that the Ni cast iron with Brinell hardness of 348 could be well machined at 182 sfpm., while the softer iron with 325 Brinell quickly dulled the tool at the same speed and feed.

This suggests correlating Brinell hardness to wear, because most sliding surfaces of machine tools are made of wear-resisting cast iron. But still for this seemingly obvious correlation, the microstructure of the cast iron and not the hardness is decisive.

Behavior of different types of pearlitic cast iron was tested against a cylindrical testing disk of hard, uniform cast iron of 230 Brinell. The average analysis of the pieces allocated to a Brinell range from 113 (very soft) to 191 (hard) was: 2.91% C, 2.61% graphite, 0.65% Mn, 2.7% Si, 0.75% P and 0.18% S.

Fig. 10 shows the correlation between Brinell hardness and total wear in grams during 2-hr. tests. The pressure was 110 lb. per sq.in., the speed 400 rpm.

Table XI[18] gives test number, Brinell hardness, loss by wear in grams after the first and second hour, and the total loss. Values below 130 Brinell show considerable wear, but such low hardness is

TABLE XI—WEAR TESTS ON 14 NI CAST IRONS[13]
(Brakeblock Castings)

TEST NO.	BRINELL HARDNESS	WEAR LOSS IN GRAMS		
		after 1 hr.	after 2 hr.	TOTAL
15	113	0.25	0.18	0.43
16	117	0.19	0.22	0.41
18	129	0.16	0.17	0.33
19	141	0.10	0.10	0.20
21	142	0.11	0.18	0.29
17	152	0.14	0.15	0.29
20	154	0.18	0.13	0.31
28	163	0.09	0.07	0.16
24	164	0.08	0.06	0.14
27	165	0.09	0.06	0.15
23	169	0.10	0.06	0.16
22	175	0.11	0.12	0.23
26	185	0.09	0.07	0.16
25	191	0.09	0.09	0.18

seldom used for machine parts of any kind, whereas from 141 to 191 the wear remains on an average value of 0.2 grams (test 24, minimum 0.14 gr. for 164; test 21 and 17, maximum 0.29 gr. for 142 and 152). Test 25 with 191 Brinell and 0.18 gr. wear was worse than 164 Brinell with small 0.14 gr. wear.

Fig. 10 therefore shows that the wear remains practically independent of Brinell hardness for ordinary use. Obviously the pearlitic microstructure again is decisive. For abrasion by wear of good castings, neither the cutting resistance of the sharp tool nor the Brinell hardness can be used as a reliable criterion. Here the increasing wear of the land of the tool, which is generally limited to 0.030 in., signifies failure of the tool edge; however, this is also shown by the increasing machinability index, caused by life tests with the machinability tester.

Machinability Index—A Useful Tool

What can one do with the machinability index in the shop that can not be done with Brinell hardness as well?

As above proved, the Brinell hardness number is not the convenient maid-of-all-work, which many production engineers like it to be for measuring machinability or wear resistance of steel and cast iron.

There can be no doubt that the force to remove a certain cross-section of chip, directly measured[9/19] during a short, real cutting action, must be the best parameter, both for the cutting resistance of any material and for the time to blunt the tool. Tangential force T furnishes:

1. Specific resistance against *sharp* tools (lb. per 0.001 sq.in.)
2. Increasing cutting resistance of slowly dulling tools by abrasiveness (abrading the cutting edge by the tool speed, e.g. v_{60}) up to failure (tool life).
3. Power consumption of the machine, as force $T \times$ speed $v =$ power.
4. Relative chip removal in cu. in. per hp. per min. as $S = \frac{396}{T}$
5. Decrease in force by selecting the most effective coolant.
6. Cutting resistance according to the maximum chip area available for a machine tool plays finally an important and indispensable factor in cutter and machine-tool design.

None of these six direct advantages can be derived from the Brinell test, which is a compression test that indicates quickly, simply and cheaply the probable tensile strength and the uniform hardness of materials (control of matrix structure of castings and solidity penetration).

Everything to its merits: structural strength and uniform hardness correlated to the Brinell test; cutting resistance to machinability index; wear by abrasion to microstructure measured either by directly visible increased cutting resistance or by controlling the width of the worn land of the tool. These are the clear and reasonable distinctive marks for the three important properties of rolled and cast materials in design (strength), manufacturing (cutting resistance) and use (wear).

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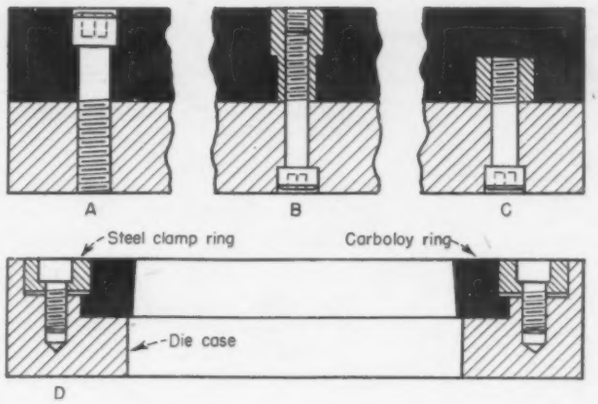


FIVE METHODS of mechanically attaching die sections have been proved by service records

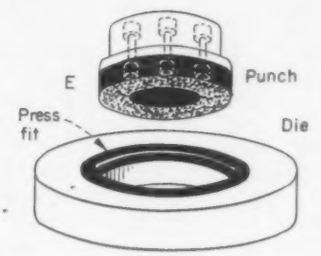
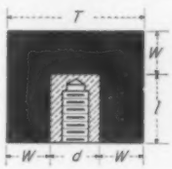


TABLE I—DIMENSIONAL LIMITS FOR MECHANICAL ATTACHMENT OF CARBIDE NIBS BY METHOD C

Width of Carbide Section In. T = (d + 2W)	**Maximum Possible Insert Diameter In. d*	*Maximum Screw Size, In.*	*Minimum Depth of Insert l, In.*	*Minimum Stock at All Points Around Hole W, In.*
5/16	3/16	No. 5	3/16	1/16
3/8	1/4	No. 10	1/4	1/16
7/16	5/16	No. 10	5/16	1/16
1/2	3/8	1/4	3/8	1/16
9/16	7/16	5/16	7/16	1/16
3/4	1/2	5/16	3/8	1/8
13/16	9/16	3/8	3/8	1/8
7/8	5/8	3/8	3/8	1/8
15/16	11/16	1/2	3/8	1/8
1	3/4	1/2	3/4	1/8
1 1/16	5/16	9/16	1/16	3/16
1 1/4	7/8	5/8	7/8	3/16
1 5/16	15/16	5/8	15/16	3/16
1 3/8	1	11/16	1	3/16
1 9/16	1 1/16	11/16	1	1/4
1 5/8	1 1/8	3/4	1	1/4
1 11/16	1 3/16	3/4	1	1/4



*These are maximum insert sizes only. Smaller inserts (3/16 in. min.) may be used depending on the nature of the application. Where size of die permits, it is usually better to use a larger number of smaller inserts rather than one or two large ones.

HOW TO DESIGN CARBIDE BLANKING DIES

BY EARLE GLEN
CARBIDE DIE ENGINEER
CARBOLOY COMPANY, INC.

ALTHOUGH CARBOLOY dies for blanking, piercing and notching, etc., of sheet metal have established production records of 20 to 40 times that of steel punches and dies, it has been only recently that a large-scale interest in and demand for carbide dies and punches have developed.

Prime advantages of carbides for this type of work are:

1. Lower tool cost per piece produced (despite somewhat higher initial cost) because of:

2. Longer life of dies and longer life between grinds, plus

3. Reduced scrap, freedom from burrs; die edges remain sharp—do not dull quickly as do steel dies.

These advantages are possible because of:

1. Availability of two special Carboloy grades (No. 55A for "light" work and No. 55B for "general" blanking). Both have an extremely high resistance to impact, especially for blanking dies and for punches.

2. Development of simple methods for mechanically attaching Carboloy nibs to shoes, using studs or screws. With the methods, nibs can be easily replaced and when required can be made to present an unbroken surface to the material being worked.

These developments have greatly stimulated the interest in carbide dies by making their construction simpler and their performance better. With them, design of carbide dies has also been greatly simplified. In general, they can be designed as are steel dies. Carbide blanking dies can be furnished in virtually any shape desired. Round-hole dies are usually designed with a solid circular nib. In other than round-hole dies, thought must be given, however, to making the carbide parts easy to finish by grinding and/or lapping, because hard carbides cannot be "machined." Thus dies for irregular shapes are usually of split or segmental construction. In this connection it should be remembered however that Carboloy nibs have no oxides on the surface and thus require a minimum of "finishing."

There are five methods of attaching the carbide die section to the steel backup member, including newly developed method C which permits presenting a continuous carbide surface:

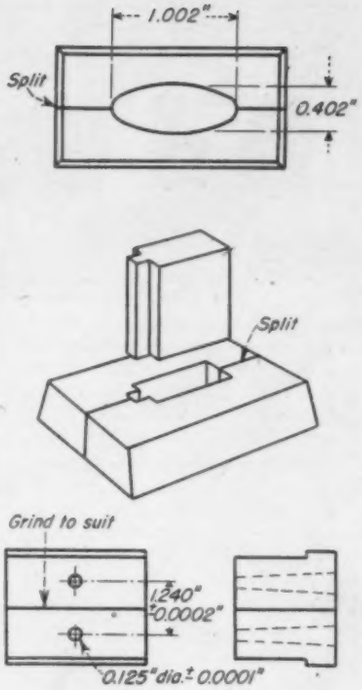
Method A—By capscrews through counterbored holes preformed in the Carboloy nib before sintering. The size of these holes accommodates standard capscrews.

Method B—By capscrews from the bottom of the shoe, threading into tapped inserts, anchored in pre-

TABLE II

MINIMUM WALL THICKNESS AND GRINDING ALLOWANCE FOR CARBIDE NIBS

Outside Diameter	Min. Wall Thickness	Max. Length	Tolerance on Unground Nibs			Std. Stock Allowance for Grinding	
			O.D. (Plus)	I.D. (Minus)	Length (Plus)	O.D.	I.D.
.125 to .187	.025	¾	.000 to .015	.000 to .010	.000 to .020	.010	.005
.188 to .250	.032	¾	.000 to .015	.000 to .010	.000 to .020	.010	.005
.188 to .250	.047	1	.000 to .015	.000 to .010	.000 to .025	.010	.005
.251 to .375	.032	¾	.000 to .015	.000 to .010	.000 to .020	.010	.005
.251 to .375	.047	1	.000 to .015	.000 to .010	.000 to .025	.010	.005
.251 to .375	.062	1¼	.000 to .015	.000 to .010	.000 to .040	.010	.010
.376 to .500	.032	¾	.000 to .020	.000 to .015	.000 to .020	.010	.010
.376 to .500	.047	1	.000 to .020	.000 to .015	.000 to .025	.010	.010
.376 to .500	.062	1½	.000 to .020	.000 to .015	.000 to .040	.010	.010
.501 to .625	.047	¾	.000 to .020	.000 to .015	.000 to .020	.010	.010
.501 to .625	.062	1	.000 to .020	.000 to .015	.000 to .025	.010	.010
.501 to .625	.078	1½	.000 to .020	.000 to .015	.000 to .040	.010	.010
.501 to .625	.094	2	.000 to .020	.000 to .015	.000 to .040	.010	.010
.626 to .750	.078	1	.000 to .025	.000 to .020	.000 to .025	.010	.010
.626 to .750	.094	1½	.000 to .025	.000 to .020	.000 to .040	.010	.010
.626 to .750	.109	2	.000 to .025	.000 to .020	.000 to .040	.015	.010
.751 to 1.000	.094	1	.000 to .025	.000 to .020	.000 to .025	.010	.010
.751 to 1.000	.109	1½	.000 to .025	.000 to .020	.000 to .040	.010	.010
.751 to 1.000	.125	2	.000 to .025	.000 to .020	.000 to .050	.015	.010
.751 to 1.000	.141	2½	.000 to .025	.000 to .020	.000 to .060	.015	.010
1.001 to 1.625	.109	1	.000 to .030	.000 to .025	.000 to .025	.010	.010
1.001 to 1.625	.125	2	.000 to .030	.000 to .025	.000 to .050	.015	.010
1.001 to 1.625	.141	3	.000 to .030	.000 to .025	.000 to .075	.015	.010
1.626 to 2.000	.125	1	.000 to .040	.000 to .030	.000 to .025	.010	.010
1.626 to 2.000	.141	2	.000 to .040	.000 to .030	.000 to .050	.015	.010
2.001 to 3.000	.156	1	.000 to .050	.000 to .035	.000 to .025	.010	.010
2.001 to 3.000	.172	2	.000 to .050	.000 to .035	.000 to .050	.015	.010
2.001 to 3.000	.187	3	.000 to .050	.000 to .035	.000 to .075	.015	.010
3.001 to 4.000	.187	1	.000 to .075	.000 to .040	.000 to .025	.015	.010
3.001 to 4.000	.219	2	.000 to .075	.000 to .040	.000 to .050	.015	.010



SECTIONAL DIES may be split for convenience in grinding the opening or to finish mating surfaces for close relationship of holes for piercing punches

formed "through" holes, by the die manufacturer.

Method C (latest) — Machineable metal inserts are imbedded in either through or *blind* holes in the carbide by the Carboloy Company. These inserts may be drilled and tapped in a normal manner by the die manufacturer.

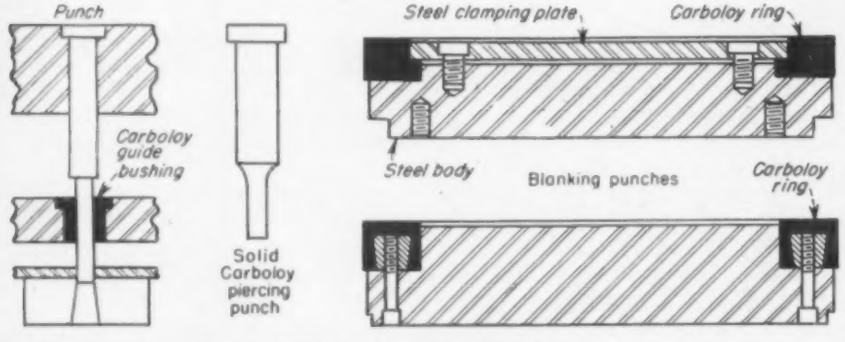
Method D—By a steel clamping ring against a shoulder preformed in the carbide.

Method E—By press or shrink fitting the carbide into a steel case. (Used more for drawing than blanking dies.)

Table I gives dimensional limits for mechanically attaching Carboloy nibs by method C. Smaller inserts (minimum 3/16 in.) may be used depending on the nature of the job, of course. It is usually desirable to use a larger number of smaller inserts rather than one or two large ones.

For method D, the shoulder width should be approximately ⅛ in., the depth approximately ¼ in.

Press fits should be made in accordance with specifications for medium force-fits (American Standards handbook).



PUNCHES may consist of carbide rings mechanically attached to steel shanks or may be of solid carbide

Minimum wall thicknesses for various combinations of O.D. and length as well as the minimum tolerances required for these dimensions are given in Table II. Larger sizes are handled on a special-order basis. Where possible, greater wall thickness and wider tolerances should be allowed than those shown.

Stock should be allowed for grinding and lapping O.D. and I.D. *Example:* A 1-in. long nib with an O.D. of 0.375 and I.D. of 0.250 in. This may be obtained either by ordering an unground nib with 0.385 in. and 0.245 in. O.D. and I.D., or by actually ordering to finish dimensions with a note: "Allow standard grinding stock on I.D. and O.D."

Other design considerations applying to carbide nibs are:

Depth of nib—Depends on length of run. Allow adequate excess stock for number of regrinds desired. Minimum depth of ½ in. is recommended for holding purposes, plus sufficient extra stock for the number of regrinds required during proposed life of die (allow approximately 0.005 in. for each regrind.)

Punch clearance—Same as for steel dies on same job.

Die clearance—Depth of straight section and angle of die clearance should

be same as for steel dies.

Shearing angle—Use same shear faces as on steel dies and punches for the same job.

Holes in dies—Dies which have two or more holes in fixed relation to each other should be designed with nib blanks in sections, obtaining fixed relationship by grinding mating surfaces of the sections. (See sectional-die illustration.)

Progressive dies — Cemented carbide nibs are easily incorporated in progressive dies. These are usually duplicates of equivalent steel dies. Proper alignment is extremely important. Openings in die case or shoe should be located and machined in a fixture.

Shearing edges—The shearing edges need not be honed or touched up with a stone as is frequently done with steel dies. The edge obtained by a 220-grit diamond wheel is satisfactory.

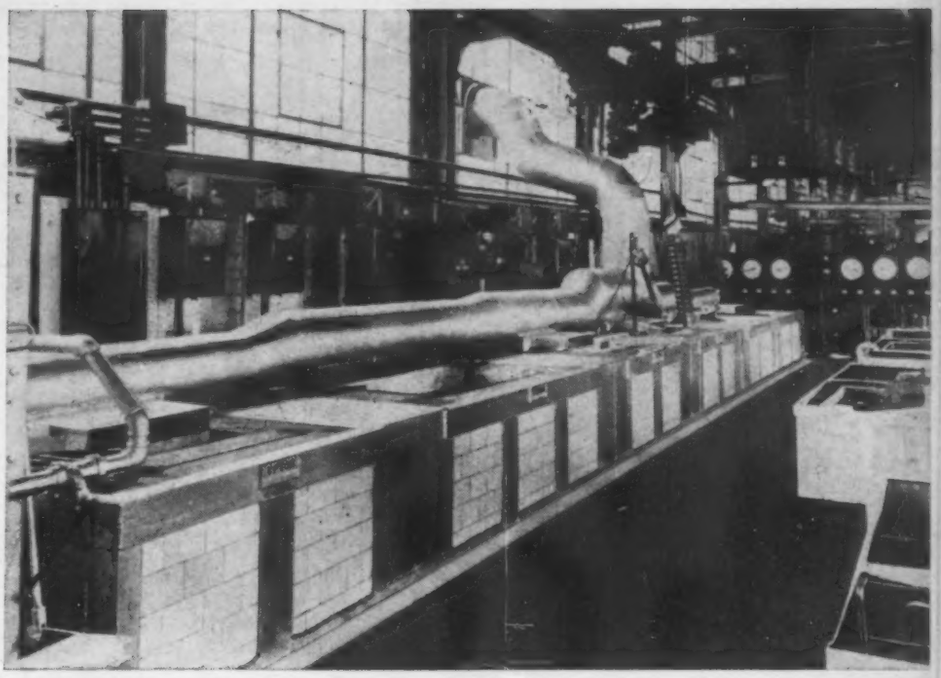
Segmental dies — Dies with carbide sections made up in segments or of split construction are recommended where irregular shapes are to be blanked or pierced, or where holes in dies have to be held in close relationship. This facilitates finishing by grinding and/or lapping.

Life expectancy of Carboloy punches also may average 20 times or more that of steel punches on the same operation. Because of the repeated impact loads encountered, carbide punches should be produced only from inherently high impact-resisting grades such as Carboloy 55B and should be attached to steel shanks by mechanical means.

If punches are 0.312-in. dia. or less, they should be made of solid carbide for best service and economy of manufacture. In fact solid carbide punches considerably larger are being regularly made and used. In any event the carbide section should be long enough to cover all points of wear.

For rough-grinding carbide nibs for punches and dies, use a 100-grit, 100-concentration diamond wheel with a resinoid bond. Finishing is done with a 220-grit diamond wheel. Good practice is to mount the nib in a fixture and place the fixture on a magnetic chuck. Surface and contour grinders of conventional types are employed.

Backup plates, shoes and cases for carbide dies are much the same as used for steel dies, but it is good practice to use somewhat heavier construction because the die can be expected to last much longer. Before dies are installed in the press, the machine should be thoroughly checked for alignment of bed and ram so the long service to be expected from carbide dies and punches is not sacrificed.



LINE ARRANGEMENT of six Upton electric salt baths, served by overhead crane, permits various heat-treatments to be applied economically by a commercial plant

ACCURATE CONTROL

Spells Success in HEAT-TREATING

Salt-bath furnaces operated on various heat-treatments require control instruments selected to meet specific job conditions

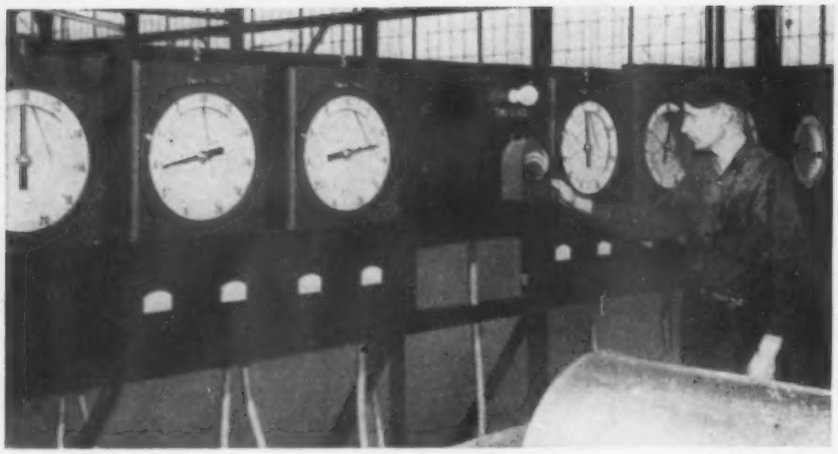
BY C. C. ROBERTS

TECHNICAL SECTION, BROWN INSTRUMENT COMPANY
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

COMMERCIAL heat-treating work on metals places rigid demands in respect to quality, cost and speed of production on salt-bath furnace operations. In commercial operations, especially, work must come out clean, scale-free and accurate. It must have physical and metallurgical characteristics required by the purchaser. The salt-bath furnace must be free from service failures and must operate constantly at the required proper temperature. And accurate automatic control system and a well-designed furnace are essential.

Recent installation has been made of six Upton electric salt-bath furnaces with electronic recording controllers, at the Dayton Forging & Heat-Treating Company, Dayton, Ohio. This installation emphasizes flexibility, dependability and accuracy of the combined equipment. A general view of the six furnaces with the common instrument panel in the background is shown together with a closeup view of the instrument panel. The layout features convenience in work handling.

The six furnaces have a Brown ElectroniK recording controller mounted on the instrument panel. From left to right, the six furnaces and controls operate and are used as follows:



MODERN METHOD is to centralize control instruments

Draw Furnace

The draw furnace is used for tempering of steel parts. Temperature requirements may vary from 300 F. to 1200 F., depending upon the purpose or type of product. The temperature measurement is obtained through a base-metal thermocouple, which is immersed in a salt bath. It is then recorded on the electronic recording potentiometer, mounted on the instrument panel. The method of automatic temperature control is more or less the same for all six furnaces, as described later.

Isothermal Quenching Furnace

The isothermal quenching furnace is used for slow quenching operations, isothermal treatments and special tempering procedures, such as Austempering used for making spring steel. The temperature is measured through an immersed thermocouple and an associated Brown recording controlling instrument, which maintains the furnace temperature at any value within the required range from 360 F. to 1100 F.

Hardening Furnace

The hardening furnace is used to heat the work up to quench temperature. Quench temperatures within the limits of 1350 F. and 1650 F. are handled in this salt bath. The thermocouple and recording control instrument are the same as is used in the previously mentioned furnaces.

High-Temperature Furnace

This furnace is used for such work as annealing stainless steel, high speed steel, and high carbon high chrome steel using pre-heat. These operations require temperatures ranging from 1700 to 2300 F. max.

At these temperatures, a thermocouple is unsatisfactory and impractical, so a radiation-type measuring device is used. As seen in the photograph, the radiation-type measuring device is mounted on top of the furnace. The Brown Radiamatic radiation-type pyrometer is sighted directly on the bath and, inasmuch as it generates an **emf** proportional to the temperature of the object sighted upon, it can be used in conjunction with the same type of recording-controlling instrument employed with the thermocouple.

Preheating and Hardening Furnace

As the name implies, this furnace is used for preheating work. In addition it is used for neutral hardening work. It operates at any temperature within the range of from 1050 F. to 1750 F. Furnace temperature is measured and controlled through an immersed thermocouple.

Surface treatments in which a case-hardened surface is desired for such applications as gears and shafts are performed in this furnace. These operations require temperatures within the range of 1050 F. to 1750 F. Temperature measurement and control is accomplished by the same means as in the preceding furnace.

The incorporation of all these features, together with the functions of the individual furnaces, combine to make this battery capable of performing various types of work such as hardening and drawing, isothermal treatments, stainless-steel treatment, liquid carburizing, cyaniding, and hardening high-speed and high-carbon, high-chrome steel using double pre-heat. This, in effect, is a complete range of heat-treatment, covering all types or the character of work which might be encountered, and permitting all to be performed in one department.

With the exception of the neutral-salts furnace, which uses a Brown Resisteat angle-type thermocouple, the rest of the furnaces are equipped with angle-type Carbucouples. The Carbucouple is an inexpensive thermocouple which has been especially designed for use with cyanide and other carburizing salt baths.

Although the Carbucouple is less expensive, it has greater sensitivity and maintains its accuracy longer.

One of six Brown ElectroniK continuous balancing recording potentiometers is connected to the measuring element in each of the six furnaces. Each instrument indicates and records not only the temperature of its associated furnace, but controls the temperature of that furnace by automatically controlling the electric power input to it. Through an electronic proportioning power input regulator, developed by Upton engineers, the rapid temperature response and fast control action of the electronic instrument combine to give an automatic control action which holds the temperature of the salt bath to within approximately ± 2½ F.

The input power control is an electronic device. It provides close "on-the-fire" control resulting in a quality product by fractionating the power input to the Upton furnace.

Vibration presented a particularly difficult problem in this installation because a 5,000 lb. forging hammer operates in close proximity to the instrument panel. The vibration, jar and shock set up by this hammer would wreak havoc on a galvanometer-type recording and control instrument, entailing constant repair and adjustment. The electronic principle of operation developed overcame these obstacles.

GOOD LEAD

PRESSURE PIPING for oil refineries and power plants, subjected to temperatures as high as 1000 F. and pressures to 1000 psi. in service, does peculiar things. On threaded joints, one fabricator has abandoned single-point tools for threading. He found lead-screw stretch might result in a thread that varied in lead. One thread, therefore, might carry the load, bind, and make the joint impossible to take down. He has shifted to planetary hobbing, reports the resulting constant lead has ended his troubles.

TALKING SHOP

Valuable Process

PAYSON BULLARD tells one story of Ed Rivett, a French-Canadian who made fancy lathes some years ago, to illustrate the old debate about the value of frosting. Ed finished lathe ways by draw-filing. When Mr. Bullard asked his opinion of the value of draw-filing, Rivett replied, "Eet costs about three dollaire, M'sieu, and the customer pays a hundred dollaire more, so eet is a good idea, n'est-ce-pas?"

Non-conducting Magnet

AMONG new powder-metal compacts announced at the Metal Powder Assn. meeting is a non-conducting magnetic material made by pressing metallic oxides (such as Alnico) with as much as 20% thermoplastic resin. This cuts weight as much as two-thirds, important when the magnet must be strong for its weight, as in speedometer magnets. Higher percentages of plastic cut weight further, permit injection molding and lower costs, but reduce compact strength.

Look—No Hands

AN ATTRACTIVE French mademoiselle was having her first ride in an American convertible. Proudly her escort demonstrated the car's refinements. One button controlled the horn, another the lights, another each side window, another the top, and so on. Finally, he pushed a button which opened the cowl ventilator, and the resulting draft lifted her skirt somewhat. As she pushed it back into place, she exclaimed prettily: "Vous Americains! Buttons, buttons, buttons! Do not you use ze hands for anysing?"

Just an idea for designers.

Carbides

ONE OF OUR AUTHORS suggested recently the term "sintered carbides" rather than "cemented carbides," because no cementing is done. A correspondent suggests as a compromise "hard-metal carbides," because cobalt is a bonding agent which might readily be considered a cement, and sintering is done on all carbides, including silicon and boron—both noncutting. Anybody want to stump for "hard-metal carbides"? As in so many other cases, we suspect the effort will be useless—users will call 'em just "carbides" anyhow.

Accounting for Foremen

AS SEVERAL SPEAKERS pointed out at the recent AGMA meeting, it is essential that everyone responsible for costs understands them and appreciates the differences between one company and another, or wage negotiations may result in a contract that destroys the company's financial stability . . . One company, to explain costs to foremen, hired a cost consultant to prepare a study of plant finances for them. Another reports real danger in common accounting use of the term "gross profit." Men without accounting experience understand only the second word, fail to deduct tax reserves, depreciation allowances, overhead, interest on investment and such elements commonly included in it. Thus they get a very erroneous picture of actual income and real profit ratios. *Result:* Misunderstanding, with claims of excessive profit and impossible wage demands.

Good-by Kitty

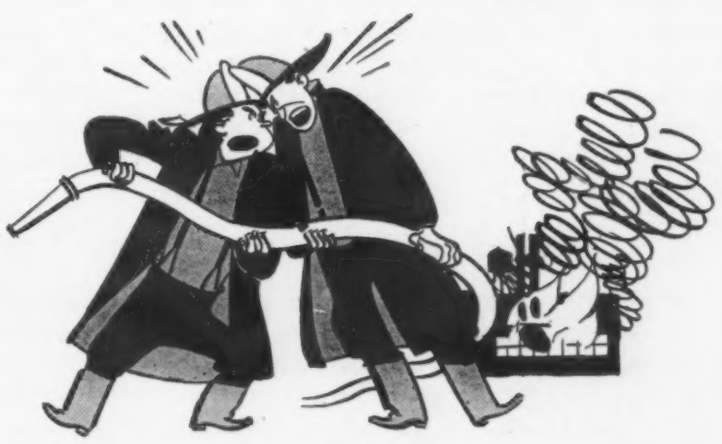
A TOP-PAY EXECUTIVE was complaining of the rising cost of living and the terrific bite of income taxes. Said the Big Wheel: "I can't live on my salary any more—have to dig into my old-age kitty to get through the year!" Before you shed any tears of condolence, we should confess that this harassed executive has a birthday in a couple of months—he will be 80 years young.

Powder Costs

STAINLESS-STEEL POWDER is now available at reasonable price for compacting, permitting filters for corrosive fluids and corrosion-resistant "powder-welded" joints . . . A continuing problem with powder metals is cost, for iron powder at 8 to 12 cents per lb. means finished parts costing as much as $1 per lb. —too high for postwar. If powder cost can be cut somewhat, such improvements in technique as exact compounding and hot pressing may bring product costs within range.

No Bargain

SPEAKER'S POINT at the AGMA meeting: "A union can bargain its members out of jobs; management can bargain the company out of business." This is worth thinking about, because present smoke screens cannot obscure the fact that management's prime responsibility is to keep the business going. When bargaining threatens that responsibility, bargaining must yield. The same comment goes for arbitration.



ROUND TABLE

Does A Divvy Now Mean A Dole Later?

"Al, why all this fuss about a bonus? Seems to me it would be smart to give everybody a few bucks extra when we have a good year."

"Yeah, Ed, it probably would—if everybody was willing to hand some back in the bad years."

"I am not talking about losses. Maybe we wouldn't have losses if we had a pay incentive. At least it would make 'em all work harder if they thought they were going to get something extra out of it."

"Ed, you need a soap box. You're talking as if all you have to do is offer all the boys a little extra money and you can forget about more plant, new machines, bigger machines. Don't forget the public doesn't guarantee you a market for five years or even six months."

"That's easy, Al. No extra money, no bonus. I'm talking about the years when we make money."

"Nuts, Ed, that doesn't add up; the years we make a profit give it out in a bonus, the years we go in the red borrow money to pay wages. What happens if we go in the red two or three years straight?"

"Al, you're trying to make this complicated. All I mean is that after you take care of everything else, divide what's left among the employees."

"Ed, a company grows by taking the money it makes during the good years and building bigger plants, buying better equipment and hiring more people. If you divide that money amongst the employees, no one will have a job long—somebody else will steal the market."

"Al, now you're talking like the Board of Directors—you must be a stockholder!"

"Look Ed, the employees get paid regardless. But in a bad year, the company loses money and stockholders don't get any dividends."

"Yeah, but remember that during the depression we took a big cut, too!"

"That's right—but the average hourly wage keeps on going up. There have been a few setbacks, but the average employee is better off than he ever was. When you start putting out more money to make a product you have to make it up some place, in efficiency, or higher sales price or some place else. I'll agree that the Christmas bonus is nice to get, but it certainly isn't as simple as you make it sound."

"Al, you remind me of one of these long-haired boys that try to make it look tough to make a few million bucks."

"Well, Ed, it's the organizations that can pull through lean years that really get big—and they have to plan during the good years to make it!"

"Al, I still think a bonus will give more efficient production."

"Don't forget that efficiency is tied up with cost and that wages don't necessarily mean buying power. It isn't what you make but how much you can buy with it that counts."

***IF PROFITS** are "divided" up in good years, can a company stand the bad ones? How much need be set aside for reserves? Your opinions and experience on this subject will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas

Undulated Bushing Guides Tool For Chamfering Elliptical Holes

ISER HERMAN
Alexandria, Virginia

5000 circular plates each had eight face-drilled 15/16-in. diameter holes inclined 12° circumferentially. Because of the obliquity, the edges of the holes were elliptical, and the specification called for a uniform 45° chamfer on all 40,000 holes within close limits.

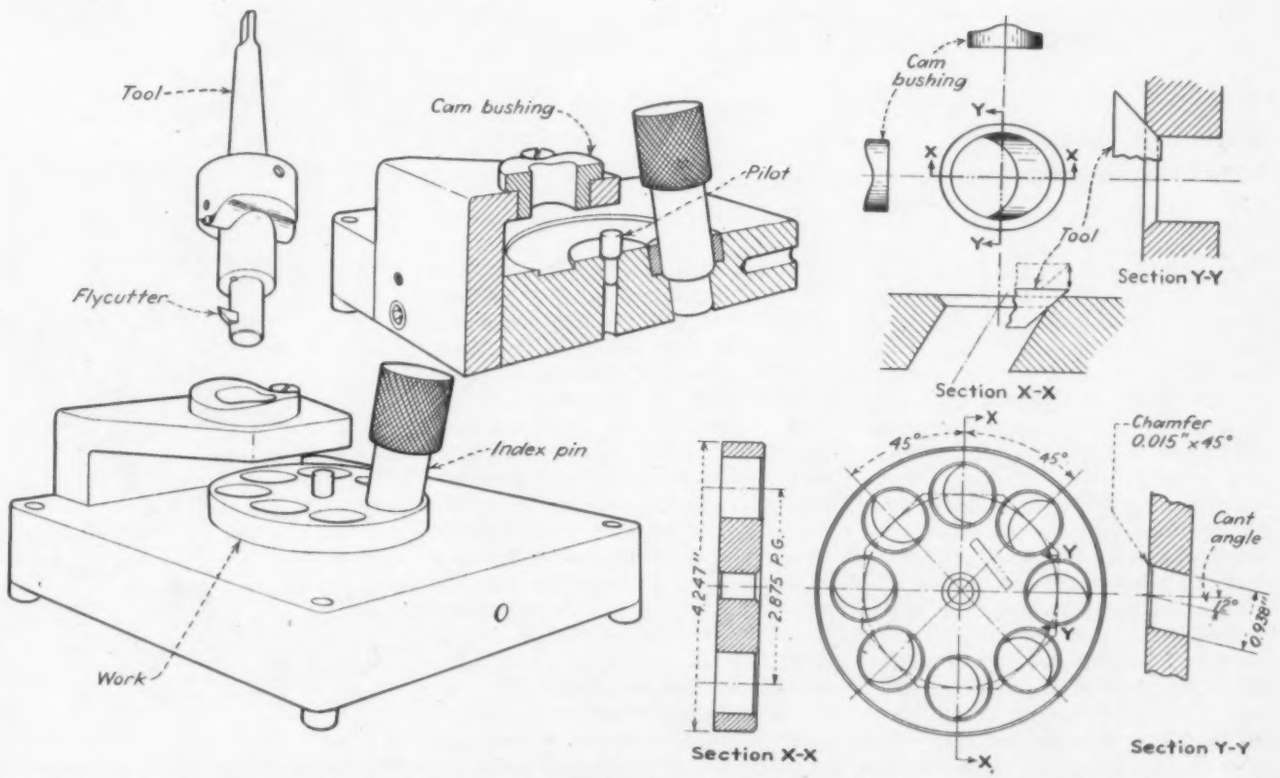
A single point countersink with a closely adjustable 45° bit was made whose shank had a transversely projecting Stellite pin, suitably backed up.

The jig held the disks one by one, locating them with a center pin and an index pin, set at 12° to line up in any hole away from the work station.

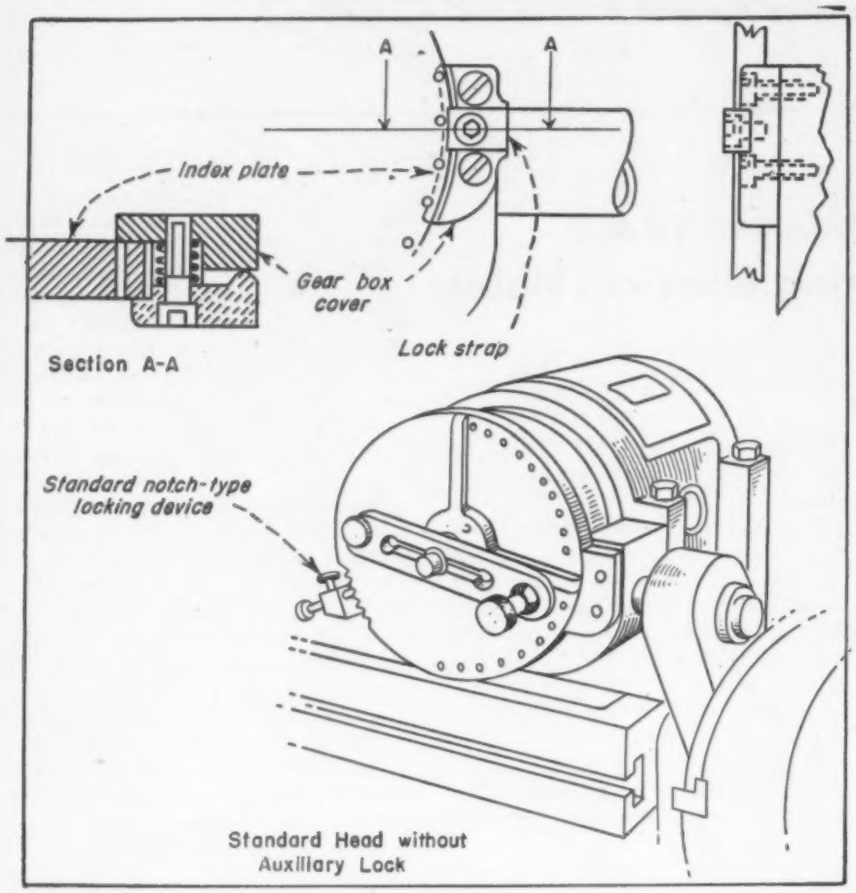
The bushing accommodated the countersink and held it vertically exactly over the work station (the center of the ellipse to be chamfered) and the bushing flange, having been left extra thick, was machined into a double sine wave—two crests and two valleys, or 180° from crest to crest.

With the countersink in a drill-press and the jig and work on the table, the tool was held down against the bushing so it reciprocated as it revolved. Because of the 45° countersink angle, the vertical motion was exactly the same amount as the difference between the major and minor ellipse semi-axes, and the point of cutting slid along the cutting edge from the outer end at the large ends of the ellipse to the inner end of the cutter at the small ellipse diameter.

Once the rise and fall has been determined (in this case 0.010 in.) the bushing undulations can be cut in a lathe very easily with a free-sliding tool arrangement driven by any kind of simple-harmonic motion generator, geared to turn at twice spindle speed. The s.h.m. device could be a scotch yoke, circular disk cam, or a plain wobble plate, powered by a small spur gear or chain sprocket on the work mandrel itself.



Angle-drilled holes are uniformly chamfered with this tool which adjusts itself to the varying diameter by reciprocating in the guide bushing as it turns



Compact straddle clamp mounts on gear box cover allowing the index plate to be locked in any position. The standard clamp remains for ordinary work

Simple Lock Clamps Index Plate Between Notches

FRITZ L. KELLER
Bloomfield, N. J.

Conventional notch-type locking devices for index plates will hold the plate in a large but very finite number of positions. Sometimes, especially on re-work jobs or follow-up operations, it becomes necessary to lock the plate at some intermediate point. Most machinists solve this problem with whatever "haywire" means seems most convenient at the time, and though, this practice is perfectly all right, it's somewhat of a nuisance, and is likely to let go unexpectedly and spoil work.

This little straddle clamp is very neat and never interferes with the other functions of the dividing head, and it permits positive clamping in an infinite number of positions. The standard locking device is left intact, of course, and is still used for most operations; the flat clamp provides an extra convenience for those unusual jobs.

The lock strap itself is milled from square stock so one end rests against the gear box cover and the clamp end just extends over the edge of the index plate. In the clamped position it should be approximately parallel to the surface of the plate. The heaviness of the cross section assures stiffness, but more important, it provides plenty of depth so the clamping screw, whether fillister or socket-head, can be fully countersunk. The screw should be as near the edge of the plate as possible to obtain the highest possible leverage ratio. A shallow, over-size counterbore in the gearbox cover around the tapped hole makes a well to hold a small coil spring which keeps the clamp from touching the index plate when not in use.

To prevent distortion of the plate and to save marring the gear box cover, it is just as well to make a new cover to perform the same function but which fits under the plate with only a couple thousandths clearance so the clamp won't bend the plate. With this cover, the whole clamp can be recessed in a deep notch the same width as the strap; this will put any torque from the index plate directly onto the new gear-box cover and prevent twisting the clamp or bending the screw.

If correctly made, the clamp will not interfere with the index plunger pin but the sector arms will have to be shortened just a trifle in order to rotate without touching the clamp.

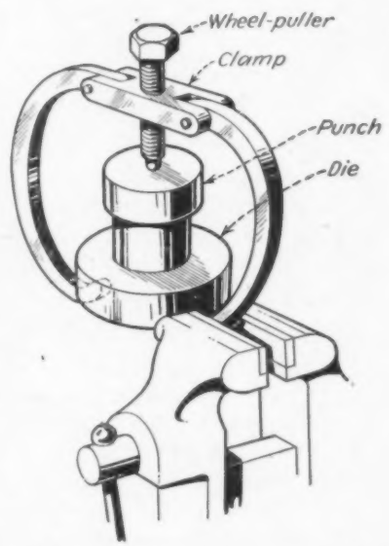
One example which clearly points out the advantage of this clamp is the unexpected necessity for changing gears in the middle of a cut because of some rate change of unusual profile.

Two Clamps Simplify Punch and Die Layouts

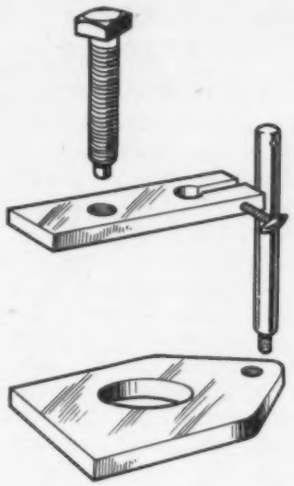
EDWARD DISKAVICH
Torrington, Conn.

Fitting punch and die sets can be improved by the use of these two simple, all-purpose clamps. One is very much like a standard wheel puller; the other is really a small, screw-type arbor press which can be folded up by dismantling, and stored in a toolbox.

Both work by clamping the punch and die together as they would match in operation, after one or



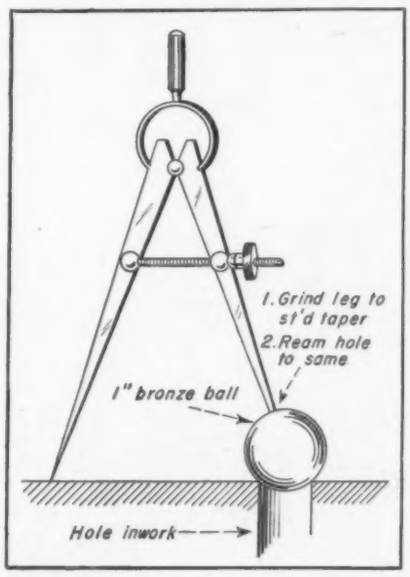
Modified wheel pullers are useful in holding semi-finished die sets together for layout and checking



A collapsible press or clamp, suitable for this and other jobs, is easy to assemble from stock

the other has been finished, and it is desired to obtain the exact contour, correctly located for the other member. It doesn't matter whether the punch is finished first or the die; if the punch has been finished, the die outline can be scribed around the punch on the die surface. If the die has been finished, the punch outline can be scribed from beneath, through the die aperture.

The wheel-puller clamp is held in a bench vise by one leg, giving equal access to all sides of the work, and the press-type clamp can be used by itself or with other fixtures.



Scribing Circles around a hole is easy when a ball is driven over one leg of the divider. *Earl R. Goddard.*

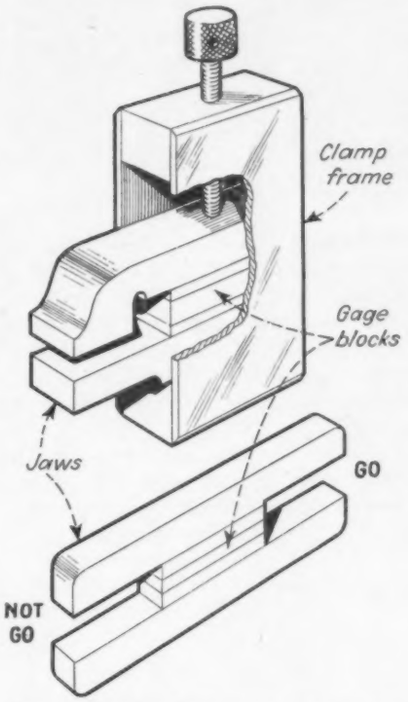
Offset Jaw and Limit Snap Gage-Block Gages

ARTHUR J. WORMWOOD
Aurora, Illinois

With the usual set of 81 precision gage blocks the two smallest possible snap gages are 0.050 in. and 0.100 in. with no intermediates, and incremental changes of ten-thousandths of an inch are possible only above 0.200 inch.

A special jaw offset 0.200 in. can be used to give any snap-gage opening desired in the smaller sizes.

Gage blocks are built up to 0.200 in. more than the required size, placed between this jaw and a standard straight jaw furnished as an accessory to the gage blocks, then clamped in the standard holder. This setup could also be used with the holder described by R. Kaden in *American Machinist* recently.



Stepped and offset jaws extend the scope of gage-block sets by making possible many new combinations

As an illustration, suppose a 0.0924 in. snap gage is required. Gage blocks 0.1004, 0.142 and 0.050 give a stack 0.2924 in. thick, and the 0.200 in. offset jaw makes the effective opening 0.0924 in., the required size.

Here is another suggestion. With the usual gage blocks and accessories the limit snap gage cannot be obtained in one setup.

To make a limit snap gage an extra-long straight jaw and an equally long stepped jaw can be used with a stack of gage blocks.

A jaw offset 0.002 in. when used with a 1-in. gage block would produce a 1.000 and 1.002 in. snap gage. If used with a 0.998-in. stack of blocks the openings would be 0.998 and 1.000 in. Using a jaw with an offset of 0.004 in. the sizes would be 1.000 and 1.004 in., when using a 1-in. block, or 1-in. plus or minus 0.002 in. by using the 0.998-in. stack.

Using one 0.002 and one 0.004-in. offset jaw in the same setup would give a snap gage with 0.006-in. tolerance.

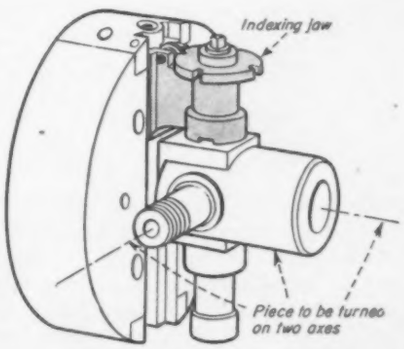
Wedging Eccentric Clamps Index Plates Tightly

LAWRENCE BASTRUP
Kenosha, Wisconsin

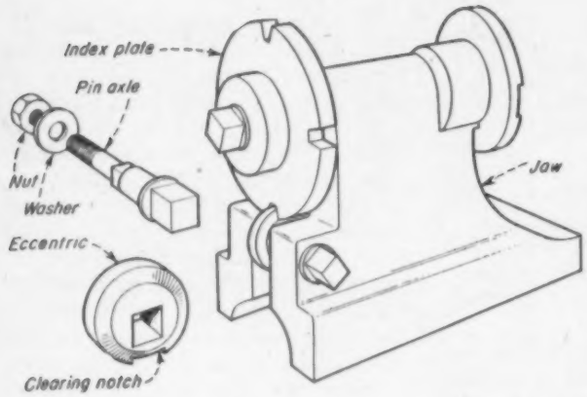
Square notch or plain pin-type indexing arrangements have the common frailty of looseness and consequently, inaccuracy. When new and tight-fitting, there may be no play, but every time the lock is inserted or withdrawn there is a little wear, and working stresses quickly increase the wear, and the looseness.

Here is a never-failing clamp designed for a turret lathe revolving or indexing jaw chuck (used to turn and/or bore work with 90° intersecting axes at a single chucking) but which will serve equally well on any similiar index plate regardless of the fixture it controls. Looseness in this case might cause the tool to turn a taper or to turn the work out of round; in any case the diameter would be oversize.

The clamp consists of a disk with tapered sides to match and fit the



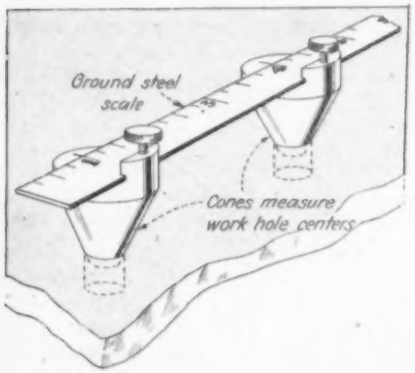
This pipe fitting has to be turned and bored on its major axis and on its 90° branch axis as well. Jaw looseness would be serious



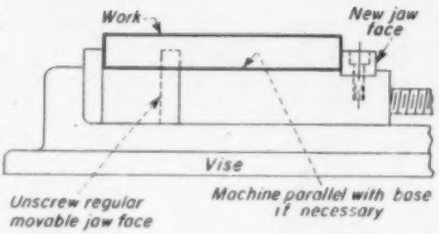
With tapered sides on the index plate notches and a corresponding taper on the eccentric, locking is absolutely solid and unaffected by wear

indexing slots; its axle hole is broached square and off-center, and a square notch wider than the index plate thickness is cut in the narrow side to clear the plate. The axle or pin is made of nickel steel in the form of a square-headed, shouldered bolt. It is inserted through transverse holes in the jaw bored directly in line with the index plate the way a worm would be mounted relative to its wormwheel. The eccentric fits on the squared portion of the pin and a washer and nut keep the unit together but allow free rotation. Clamping is accomplished simply by turning the pin until the eccentric wedges in the index plate notch.

The clamp doesn't save any time over the usual clamp, directly at least, but it assures more accurate work and saves time indirectly by eliminating re-work and second operations.

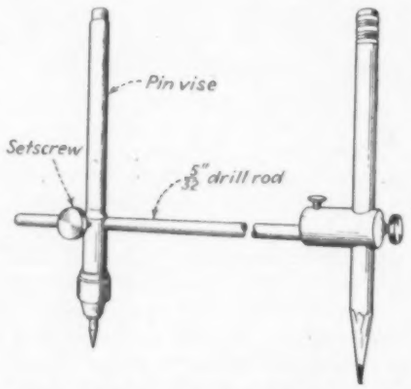


Hole Locater—Two cones machined to fit a standard scale make a convenient tool for measuring the center distance between any two holes of equal diameters ranging from ¼ to 1½ inches. With variations the idea can be adapted to measuring between holes of differing diameters and to the edge of a piece. *Ed. C. Grannell, Newark, N.J.*



Secondary Vise Jaw—Removing the hardened moving jaw face on a milling vise and bolting a small piece near the rear of the wide moving jaw greatly extends the vise capacity, and for thin work, eliminates the need for blocking or parallels.

Watch out for the oil hole and you may have to take a surface cut to make it parallel with the base. *C. W. Pressey, Bell Meade, N. J.*



Pin Vise Trammel—Any toolmaker can easily make a pair of trammels for drawing purposes. When I made a pair, I utilized a pin vise for the rigid leg holding the center or needle-point, a phonograph needle in this case. Drill one hole for the beam, another for the setscrew and the vise remains undamaged for other uses—a plain scriber holder, for instance. *Roscoe B. Boone, South Bend, Ind.*

Drill Jig Air Ejector

A. F. SCOBLIC

Milwaukee, Wisconsin

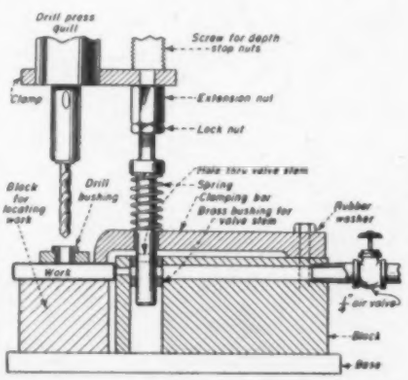
Small parts are often easy to insert in jigs but sometimes can be difficult to remove. Here is a jig which incorporates automatic spring clamping and air ejecting.

The operating mechanism consists of a rod attached to and parallel with the drillpress quill. This rod has two functions; it depresses the coiled clamping spring and holds down the clamping bar during the working stroke, and it opens an air port in its own guide bushing on the return stroke, allowing air to blow through and eject the part into a chute, and at the same time blow all chips out of the jig.

The upper end of the rod is turned and threaded to take the place of the standard depth gage screw, and provide a way of adjusting its valve opening position. The clamp bar is mounted so it just clears the work when unstressed and the clamping spring first has to bend the clamp slightly before it touches the work at all.

The drillpress used in this case had an air-powered feed, speeding and simplifying the whole operation, and the automatic clamp-ejector improved it still further.

The transverse hole in the valve rod should be located so it lines up with the corresponding bushing hole for ejection just at the point where the coil spring no longer exerts any pressure on the work. This makes the ejection a momentary process to waste the least possible air. On the feed stroke, the operator holds the part until the rod passes the open point.



Drillpress attachment clamps work, ejects, and blows out chips automatically by air power

Taper Attachment Improves Vertical Boring Mill

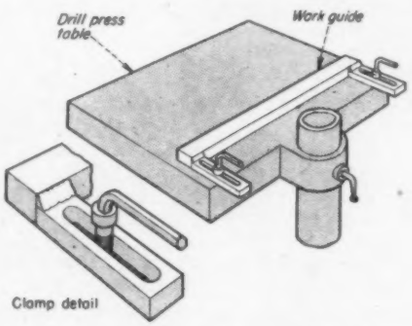
CHARLES SMITHYMAN
Alliance, Ohio

We had a number of large internal gears to machine complete with one side tapered for rollers. Previously the taper had been stepped off with a broad nosed tool; this method permitted the use of one head only and necessitated hand feed which increased machining time and therefore the cost. This taper attachment permits the use of both heads. One head is used for boring in the conventional manner while the other is used with the attachment to machine the taper.

To permit the use of this attachment the counterweight chain must be removed from the mill ram permitting the ram to run free.

A U-shaped guide is bolted to the toolhead with the slide bar in place. The latter can then be set to the desired taper by adjusting it along the slotted hole in the longer vertical member. The machine is operated with the cross feed on, and the guide provides the proper vertical feed to machine the desired taper on the gear.

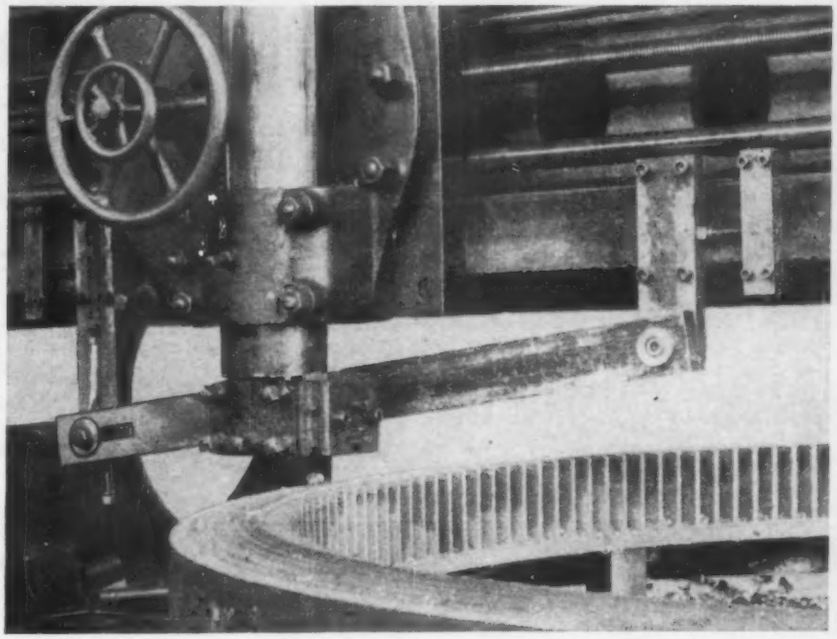
Use of this attachment saved 8 hr. machining time on each gear.

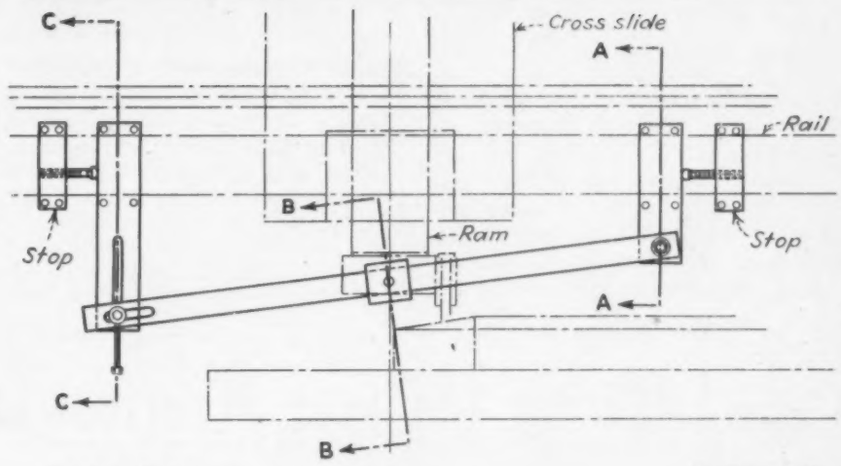


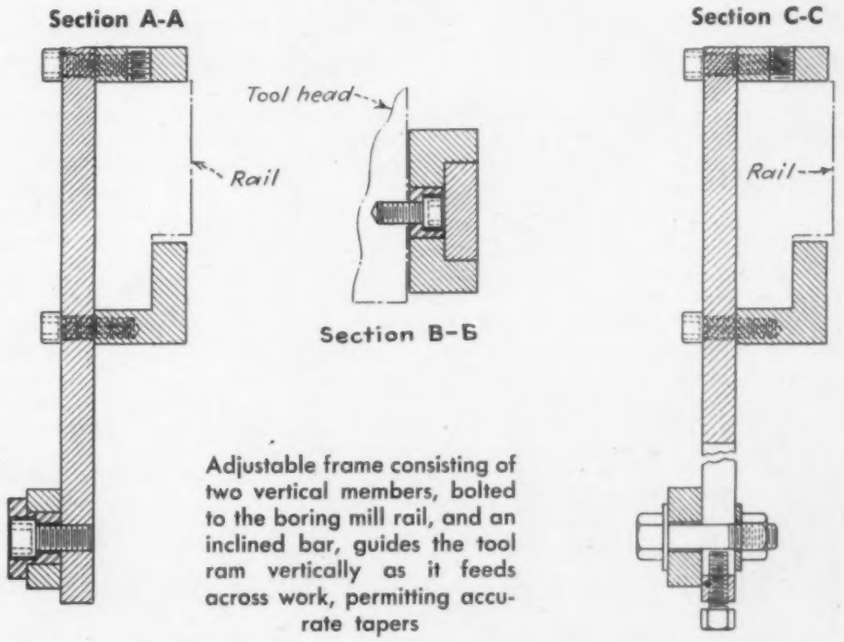
Drilling Guide—This easily made adjustable stop can be applied to almost any standard drillpress table where it will prove very satisfactory for holding and positioning work that does not require clamping to the table of the machine.

Accidents occurring when a piece being drilled suddenly starts to revolve can usually be avoided by the use of this guide.

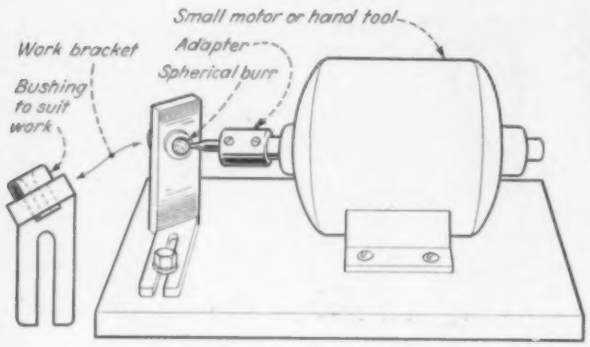
The positioner can be welded as shown, or screwed together. Socket head capscrews and corresponding wrenches are used for the locking screws. *Edmund L. Johnson, Pittsburgh, Pa.*







Adjustable frame consisting of two vertical members, bolted to the boring mill rail, and an inclined bar, guides the tool ram vertically as it feeds across work, permitting accurate tapers



Small motor, cutter, and spindle adapter, plus a work guide bushing, make a useful tool for cleaning up screw machine parts

Portable Burring Machine

HARVEY E. ESSMANN
St. Louis, Missouri

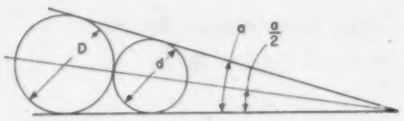
Removal of cut-off teats on screw machine products has always been somewhat of a nuisance. I have overcome the difficulty by rigging up this simple fixture which consists of a piece of cold-rolled steel bent up as shown, with a hole drilled to receive a bushing of the proper dimensions to receive the work. An assortment of bushings can be kept on hand for various diameters of stock.

The first application of this fixture was mounted in a drillpress necessitating double handling of the work. By mounting the fixture on a plate and adding a small motor, the unit becomes very portable, and the operator may set it on a table next to the screw machine and deburr the pieces at leisure.

By using a spherical midget milling cutter or rotary file the teat may be removed from the work so neatly that traces of the operation can hardly be detected with the naked eye.

Angle Formulas—Any two disks can be used to establish and lay out or measure angles, sine-bar fashion. The general equation for an angle formed by the mutual tangents to two different-diameter disks, in contact, is:

$$\sin a = \frac{D-d}{D+d}$$



and the more useful form of the equation is:

$$d = \frac{D\,(1-\sin\frac{a}{z})}{1+\sin\frac{a}{z}}$$

The accuracy of the setup varies inversely with the size of the angle, and with the dimensional accuracy of the disks.

To increase the accuracy of the angle and cut down on the amount of close machining, the diameter of one disk should be determined by the conditions of the setup and machined to that size. The measured diameter of this disk is then used in the calculations to obtain the diameter of the other disk, which is then machined as closely as possible to the calculated size. *Claes L. Hultgren, Riverside, Illinois.*

Identifying Mandrels — Center punching the letter "S," dot by dot, is a quick way to mark the small end of a tapered lathe mandrel and thus avoid mistakes and wasted time in setting and removing work. *Thomas Trail, Boonton, N. J.*

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An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Thirty-second Selection—S. Framurz' Precision Taper Measurement

NEWS OF METALWORKING

Chicago Appliance Manufacturers See Heavy Backlogs into New Year

CHICAGO—Predictions of recession, falling off of demand, and overproduction are still greeted with laughter by one sizeable segment of Chicago's metalworking industry—home appliance manufacturers.

Last fall, many forecasters said supply and demand in the appliance field would be in balance by mid-1947. Despite greatly increased production schedules, however, appliance makers say backlogs will not be cut down before 1948.

Refrigerators continue in short supply. Demand for electric ranges will not be satisfied for more than a year. Makers of water heaters cannot see any softening of demand ahead. Washing machines and vacuum cleaners cannot be turned out fast enough. "Infinite" demand is predicted for the new glamor-child of the industry — automatic dish washers.

Smaller Items Easing

Makers of smaller types of appliances—toasters, electric irons and such items—report they are closer to a balance between supply and demand.

Hotpoint, Inc., is turning out 50% more refrigerators now than it did a year ago, and output will be stepped up another 30% by Jan. 1. Hotpoint is also making 1,100 electric ranges a day.

Makers of water heaters say production exceeds that of prewar by 50% but demand remains heavy.

Thor Corp. is making three times as many washing machines as prewar, and output will be further increased. Output of washers and electric ironers is running 30 to 40% behind demand.

Admiral Corp. estimates it will be at least a year before the firm will be able to supply refrigerators and ranges for immediate delivery.

Borg-Warner similarly reports it will be unable to make immediate deliveries of refrigerators, ranges or washers until next year.

There are a few peculiar aspects to the appliance industry today, however. While makers of name-brands cannot meet demand, there is an over-supply of some unknown brands of appliances.

There are some 7,000 new firms in the electric appliance field, and many of them are finding the going difficult. Manufacturers are also having difficulty in revamping their distribution systems to meet postwar conditions.

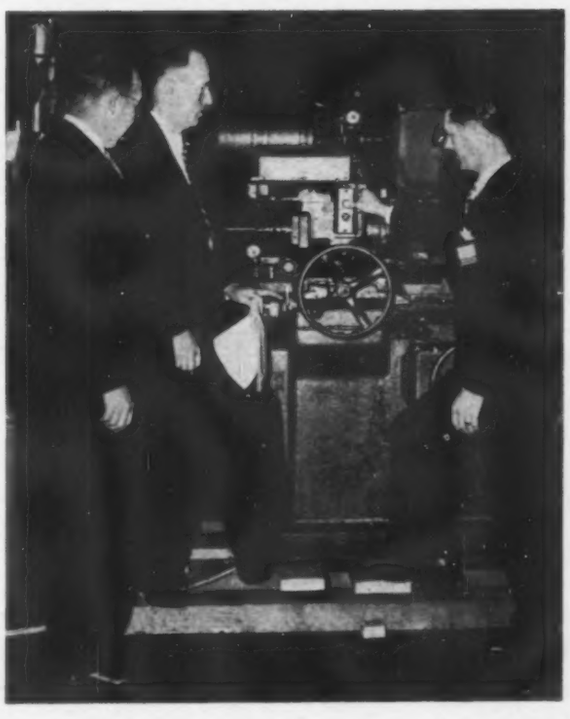
The tremendous increase in rural electrification in recent years has opened a vast market for appliances, which almost every company attacked immediately after the war. As a result, many feel too much attention has been paid to the farm market and urban customers have suffered.

WAA Issues Catalog Instruction Following Criticism of Program

WASHINGTON — War Assets was prepared at this writing to announce new instructions to regional offices, authorizing them to catalog all surplus machine tools as to description, location, and price. The catalogs will be available to purchasers at Customer Service centers, and will be kept current through deletion lists.

The instructions, issued as the House Surplus Property Committee strongly criticized WAA's disposal program, also provided:

- 1: That regional directors determine locally which machines are in short supply in their regions. This determination formerly was contained in a national list. Items in short supply must be offered first to priority holders.
- 2: The discount of 12½% on surplus standard general-purpose machine tools is increased to 17½% for tool rebuilders, manufacturers, exporters, dealers and other distributors who purchase for resale.
- 3: Commission of 12½% for WAA-approved dealers remains the same. These dealers find customers, whereas the groups getting the increase invest their own capital in machines for resale.
- 4: Applications from schools and other non-profit institutions will be received during an offering of machines, and will be acted upon within 30 days after sale to non-priority holders. Special-purpose machines are available any time, after screening for "JANMAT" (Joint Army-Navy Machine Tools), to donees, who must pay any packing and loading costs. Discounts to schools are unchanged.
- 5: A machine bearing a JANMAT tag can be sold if shipping instructions haven't been received, if the purchaser asserts it is for domestic production, and if no identical machines are in stock at the location.



Machine Tool Donation program was inaugurated recently at Nash-Kelvinator, Kenosha, Wis. plant, which was scheduled to be cleared of all WAA inventory by July 1. More than $160,000 worth of surplus machine tools were given to midwestern schools and municipalities on payment of shipping charges. (L to R) Walter I. Brown, special assistant to WAA Chicago regional director; P. B. Bass, Jr., of the University of Chicago purchasing department; and James Dick, WAA field director at the plant, are shown inspecting the machines

Gaging Business

Steel Tightness to Stay

Don't be disappointed if tightness in steel is prolonged beyond the time when you expected it to relax. Curtailment of steel output necessitated by the coal shortage postpones indefinitely the day when you will be able to get all the steel you want.

▸ Sheet steel isn't the only spot in which steel is causing headaches. Bolts and nuts is another. Tin plate demand is enormous and gets first call on semi-finished stock ahead of sheet and strip.

Automobile Assemblies High

Automobile production has been hovering around the 100,000-units-a-week mark. It is a struggle to keep it there because of materials shortages.

▸ At this point, the year's assemblies are estimated to be close to 5 million cars and trucks, though it will be tough to get up to that figure.

Farm Implement Output Good

Farm implement manufacture is steaming along, and current orders are good. Railroad car building is proceeding at a fast clip, but is not yet up to the desired level. Backlogs are piled high, with no dents being made in them.

Builders Do Outside Work

As backlogs of machine tool builders dwindle, more and more companies are turning to outside contract work to keep their shops busy.

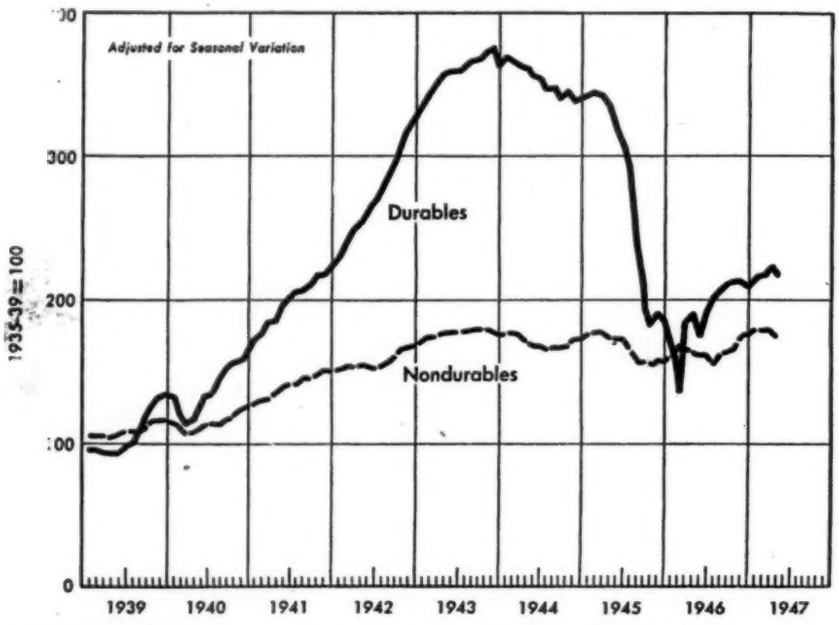
▸ Likewise, some builders have developed and are marketing new products on a permanent basis to help diversify their business, which heretofore has been entirely dependent upon machine tools.

▸ There has been no concerted raising of machine tool prices, despite published reports intimating as much. A number of companies have increased prices 5-10%, but others have not taken any action recently.

Tool and Die Work Declines

Contract tool and die business is trending toward lower levels. This trend is hardly discernible in the present volume of shop work. It shows up in the amount of new orders booked.

▸ In May, sales were not too good, having been down considerably from the April figure. Immediate outlook hardly inspires enthusiasm. Employment is off and appears likely to stay down.



Data: Federal Reserve Board — *Prepared by McGraw-Hill Economics Department*

Production Starts Down, but the April slump in durables, which was due to strikes in coal and machinery, rebounded in May and June. Steel, machinery and auto production lead the way in heavy goods. Soft goods, which saw its sharpest postwar dip in April, has continued dropping

Non-Ferrous Outlook Better

Non-ferrous metals are easing. Copper consumption remains at or near a peak, but consumers are less concerned about building inventories.

▸ The aluminum situation is fairly satisfactory, with fewer tight spots than a month ago.

Production Near Record Rate

Metalworking companies continue to produce at a near record rate at the expense of backlogs. Incoming business is spotty, and in many cases is considerably below current shipments.

▸ Despite this soft tendency, there are few viewers-with-alarm in the metalworking industries. Employment still is at a high level and promises to stay there.

▸ Moreover, the flow of new orders for production equipment, particularly machine tools, should become heavier as the year wears on.

Machine Tool Sales to Rise

Look to Detroit for an upswing in machine tool sales. Automotive companies have been extremely conservative buyers up to now, but they are loosening their purse-strings.

▸ New engines and automatic transmissions will provide chief impetus to new machine tool buying. Motor car companies especially are loading up builders of highly specialized equipment.

▸ Ford and General Motors are the best sources of business, and will continue to be.

Foreign Orders Lag

Farm implement and airplane engine companies are in the market for new machine tools for new tooling programs. Foreign machine tool orders fail to come up to the anticipated total because of lack of dollars abroad.

Plenty of Appliance Business

Electric appliance makers have plenty of orders on hand. The outlook is best in refrigerators, electric ranges, washing machines and vacuum cleaners.

▸ Despite production far exceeding prewar volume, unsatisfied demand is terrific. The pressure is not quite so great in such items as toasters, electric irons and radios.

▸ Incoming orders for heavy electrical equipment have stayed up, with deliveries being quoted in 1950 on turbines and other units. Electric motor situation is improving, but manufacturers still have a pile-up of business which will take months to work off. Fractional horsepower motors continue in very high demand.

Demand for Sheet Steel Still High; Miners' *Vacation* Cuts Production

PITTSBURGH — The startling imbalance of steel stocks by important consumers as late as July 1—evidenced by a shut down of a large auto manufacturer — vies sharply with over-supply in some steel items.

Various types of sheets are in such great demand that the situation supply-wise is not expected to ease this year. The opinion has been voiced that sheet demand is about twice that of the prewar period. It is doubtful that actual demand had been figured that high earlier in the year.

A few items, on the other hand, such as alloy steels, seamless mechanical tubing and large and cold-finished bars, are available relatively promptly from the mills.

Coal Vacation Brings Delays

The vacationing of miners in the bituminous coal fields had ominous implications for steel mills. While at this writing it appeared John L. Lewis had won agreement from mine operators on substantial gains, the effect of the mine shutdowns will be projected into delayed deliveries.

While captive mine owners were berated in some quarters for "pressuring" other operators into agreement for meeting Lewis' demands and keeping the coal mines operating, it was pointed out that steel mills would soon close down in a coal crisis and production would be dealt a terrific setback.

After settling its contract negotiations with the United Steelworkers, steel executives were determined to do everything possible to avoid banking furnaces because of a coal strike.

Steel Prices Point Up

Coal and steel prices will naturally be affected upward in the settlement, but from gigantic operations of the "gray market" it is felt that the tremendous steel market will not show the slightest semblance in falling off over price protests. There is still too much of a clamor for all the steel that can be delivered.

The temporary drop in capacity operations will have an effect on delivery of tonnage quotas to freight car manufacturers. Steel mills had been meeting promised quotas of shapes, plates and other steel items to freight car manufacturers. As a matter-of-fact, up to July 1, mills had exceeded minimum promises in respect to shipments.

Plate makers are behind on their commitments and a shipyard strike in the East eased the pressure slightly. While over-all reports on construction are that big projects continue to be shelved because of high costs, local building lists appear to contain more industrial projects than recently.

Industrial Expansion in Chicago Hits $90 Million in 6 Months

CHICAGO—Industrial expansion programs announced in Chicago in the first half of this year aggregated almost $90 million, and indications are that the growth of the metalworking industry in this area will continue.

A recent survey shows that in the last six years about 1,200 new plants and industrial additions, amounting to an investment of nearly one billion dollars, were built in Chicago. Industrial engineers say that no recession in industrial building is in sight.

Most of the major steel producers in the Chicago region have announced expansion programs, and other industries—notably appliances, farm machinery, and heavy industrial and construction equipment — are also increasing production facilities.

Warship Builders Turn to Subs As Navy Pushes Replacement

WASHINGTON — Partly because of atomic bombs and aviation, the warship building business is shifting toward submarines, perhaps on a vast scale.

All of Navy's slow speed sub fleet is obsolete and a full replacement push has already begun with two 2,000-ton, high-speed, long-range experimental submarines in process at a cost of $30 million. Funds for six more will be asked soon.

Under serious super-secret study are types to launch planes from the surface and torpedoes and air missiles from down under; cargo and troop carriers capable of beaching on enemy shores; special designs for Arctic use; and midgets for scouting and harbor jobs.

Even these new types may well become obsolete under full impetus of nuclear power, which will do more for submarines than for any other weapon carrier.

U. S. Navy subs, probing under Arctic ice, are finding many problems which must be overcome.

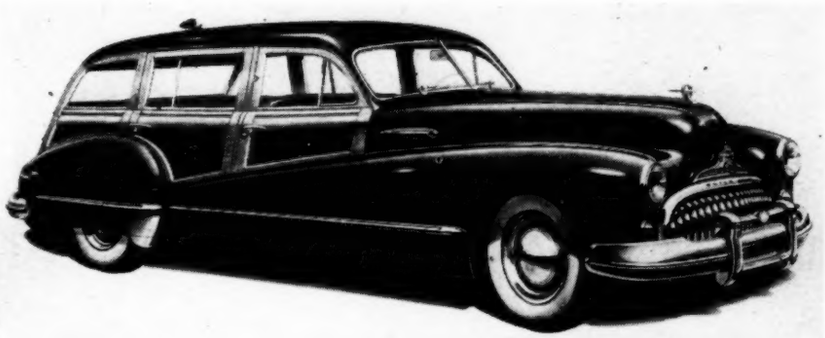
The easiest application of nuclear power to transportation will be on sea vessels. It will give submarines infinite range and still higher speed at any depth the hull can stand. Air for personnel can be cleaned of carbon and used over and over. Additional breathing air can be carried in compressed tanks.

On structural strength for greater depth, the Navy says nothing. It is a difficult problem. Non-ferrous metals can be used if magnetic detection proves too effective against "degaussing" methods developed in the recent war.

Cleveland WAA Office Catalogs $90 Million in Machine Tools

CLEVELAND — Machine tools with an acquisition cost of about $90 million remain to be disposed of by WAA in the Cleveland region as of July 1. Listed and offered for sale now are about $40 million of machines of all classifications, the remaining $50 million worth to be declared surplus soon.

These figures were arrived at by Cleveland regional WAA officials following a minute and careful checking of all surplus now on hand and in WAA warehouses, and what is known to be soon destined for the surplus account.



Buick Estate Wagon on a series 70 Roadmaster chassis has been introduced for city and country driving. Featuring sweeping airfoil fenders, this six passenger Estate Wagon is built on a 129-in. wheelbase

Machine Tool Builders Support Proposed Industrial Reserve Bill

WASHINGTON — Machine tool builders are urging support of a bill introduced in the House (H.R. 3670) which would provide an essential nucleus of government-owned industrial plants, and a national inventory of machine tools and metalworking machinery for emergency needs.

Because of other important legislation confronting Congress before it adjourns, it is debatable whether the bill will receive full consideration in this session. Proponents are urging consideration, however, on the premise it represents a forward step in national defense.

Specific Powers Cited

The bill would place power in the hands of the Army and Navy Munitions Board to determine which surplus plants should become part of a national industrial reserve.

The board would also be authorized and directed to:

● 1. Determine what types and sizes of machine tools and other metalworking machinery and what quantities thereof should be preserved under the provisions hereof, and to notify the appropriate disposal agency of such determination.

● 2. Designate places of storage which are under jurisdiction of a disposal agency in which various items of machine tools and other metalworking machinery may be stored.

Storage Maintenance Rules

Under the bill, machine tools and equipment designated for national reserve would be transferred without reimbursement to the Federal Works Agency for storage and maintenance. The items will not include those deemed in "short supply," but any such item which remains unsold for six months from the time it is offered will be considered as not in short supply.

Machines Could Be Loaned

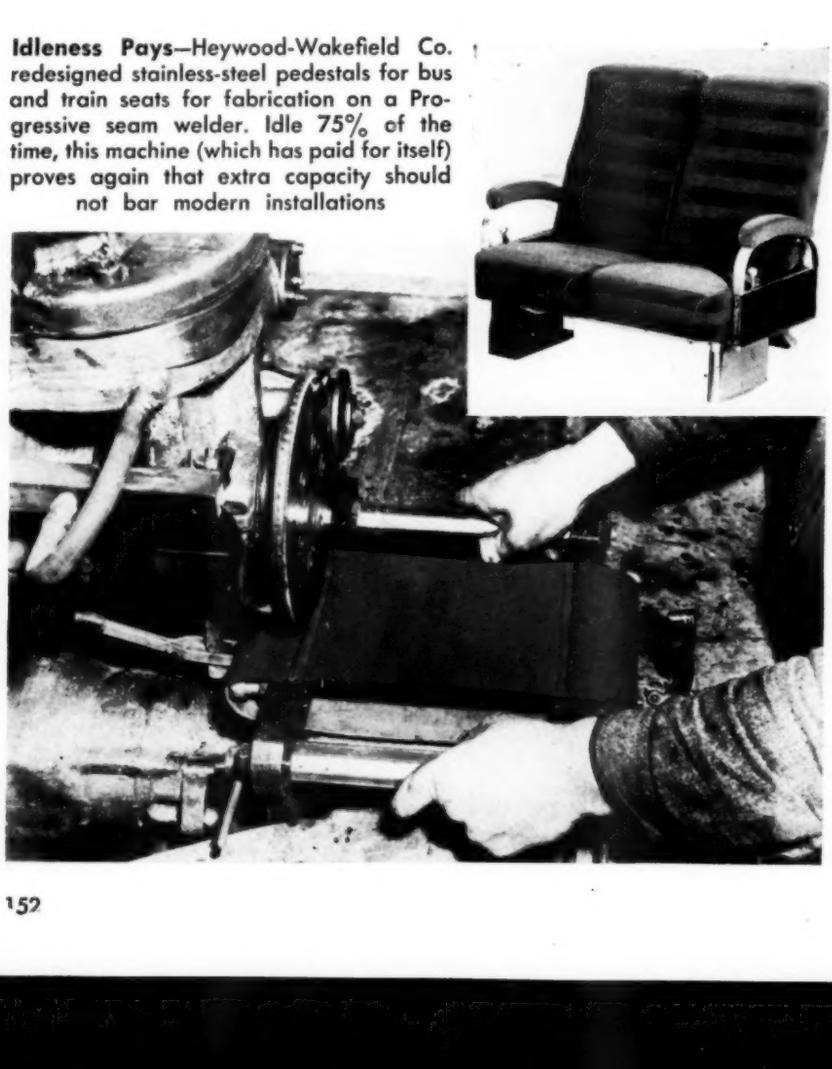
The board would be charged with issuing regulations governing methods to be followed for the care and handling of machine tools and metalworking machinery. It would also issue orders to provide for *lending*, free of charge, machine tools and similar equipment to non-profit educational institutions and training schools.

Among other responsibilities of the board would be: transfer of machine tools needed by the military services for use in national defense for production, replacement, or test purposes; issue orders for disposal of items deemed unsuitable for the machine tool reserve.

Committee of Civilians

A review committee would be designated from civilian life and be composed of men familiar with various fields of American industry, including shipbuilding, aircraft manufacture, machine tools, and arms and armament production. This committee would review at least once a year, and oftener if necessary, all plants and machine tools held in reserve, and make specific recommendations to the board.

Idleness Pays—Heywood-Wakefield Co. redesigned stainless-steel pedestals for bus and train seats for fabrication on a Progressive seam welder. Idle 75% of the time, this machine (which has paid for itself) proves again that extra capacity should not bar modern installations



Chicago Metalworking Executives View Labor Law with Misgivings

CHICAGO—The new labor law is viewed with some misgivings by Chicago area metalworking executives. While most business leaders say that they prefer having the new law to no law at all, they nevertheless fear the complications that will ensue in their relations with unions.

Business Regulation Seen

One criticism, generally expressed, is that the new legislation adds regulations to business rather than removing them. The attorney for one large metalworking firm asserted that "men in our profession will be the chief benefactors of the law." He predicted that labor-management relations might be uneasy for years, until a great volume of clarifying litigation is carried through the courts.

Court Tests Expected

Many Chicago area firms have "closed shop" agreements with unions, and company executives expect the unions to take the matter to court before they give up these contracts.

Very few Chicago executives have been willing to express opinions publicly on the new law. The Chicago Association of Commerce and Industry, after studying the law, said:

"It changes the framework of industrial relations, both at law and in practice, as significantly as did the National Labor Relations Act. The meaning of many of its provisions will not be clear until they are tested in the courts or worked out between labor representatives and management. In the long run, the test of the law will be whether it results in a more effective and continuous operation of the industrial system."

Detroit

IMPROVEMENT NOTED IN MACHINE TOOL BUSINESS . . . SOME 1948 MODELS MAY APPEAR BY END OF YEAR . . . EMPLOYMENT LEVEL HIGH

Tooling Studies Increase

Machine tool business in the Detroit area, while still faltering, is somewhat improved over its position earlier this year. Automobile industry business is not accounting for any significant share of this turn—the advance appears to be more general than that, built on the desires of all industry to reduce direct labor costs by more efficient equipment.

One interesting shop byproduct of the tendency toward higher production machinery is becoming evident in the increasing amount of study devoted to tooling. The underlying reason is simple. A machine which produces, say, three times as many pieces as an earlier model machine will be down for cutting tool changes three times as often in a specific period.

When the percentage of down time increases in any such proportion, it focuses itself more intently on shop management. Numerous companies, therefore, are studying all possible means of reducing the proportion of machine down time.

One solution which has been approached is the idea of assembling tool holders and tools to gage tolerances, right in the toolroom. Then when a tool change is required on the machine, the entire tool holder assembly is taken off.

Another idea being studied in a more general way, primarily, in machine tool companies, is designing machines in such ways as to make tool changes easier and faster. Probably more on this subject will be seen and heard at the forthcoming National Machine Tool Show.

Required Steel Remains Tight

Steel in wanted specifications continues extremely tight at Detroit and was responsible for the shutdown of Chrysler plants early in July, before and after the Independence Day holiday.

Some mills are extending their order books to as much as four months ahead—until recently there were many which held them to 45 days. The space filled up at once, of course.

A number of inquiries for 1948 model steel requirements are being made, and a few SVD orders may already be on mill books at this time. Some of this latter ordering may be combined with clean-up runs for 1947 models.

In fact, inquiries and the trickle of actual order placements at this time are indication that a few companies will be showing their next year's models before the end of the year.

Cold-rolled sheets may tighten up temporarily before too long, due to the plans of one large source to reduce its forward commitments over a month's rolling schedules, in order to catch up on carry-overs. On the other side of the fence, steel trade sources report that cold-finish bars are definitely easier, particularly in the larger sizes. Another item which has eased is wire rope, presumably because of the release of government stocks.

Changeover Sag Expected

The Chrysler plant shutdowns reduced the 100,000-unit-a-week clip of the auto production plants quite considerably during early July. The balance of the month, however, will see the previous level restored. That rate of manufacturing will likely go on for another couple of months, as matters appear now.

Then there will be the first beginnings of the effect of changeovers for 1948 models, and a modest sag can be expected. However, this will not be too significant, inasmuch as it does not appear that the volume manufacturers will be changing over that early.

The prospect of somewhat improved sheet steel supplies later in the year indicates that probably the second half of 1947 will see output about equal to the nearly 2,500,000 produced in the first six months. Changeover lags at the start and the end of the fourth quarter will be counterbalanced by enlarged manufacturing volume in between.

Unemployment Virtually Vanishes

There is always balm in Gilead, and the steel shortage may be proving a bit of a blessing. Unemployment in the Detroit area has all but disappeared, even though automobile production is no better than 70% or so of normal.

To bring production to capacity, now expected early in the second quarter of 1948, will probably require increases of 10 to 15% in the working force. As of now, that many additional workers are not in sight.

The auto industry does not quite know what it will be able to do about this situation. But it has been buffeted around so much during the past few years that it is simply waiting fatalistically to see what happens.

New Hiring Overcomes Layoffs

Manufacturing employment in the Detroit area is resisting all downward pressures, even though May marked the first time since the war that the number of plants whose work force is reduced exceeded those which gained. Increases in automobile industry employment were largely offset by layoffs in the machinery industries because of short supply of parts. This balance has overcome a labor shortage.

Light Weight Jeep Truck is available in seven body styles from Willys-Overland Motors. Its four-wheel-drive enables the vehicle to go practically anywhere under most weather conditions. An adaptation of the wartime Jeep, on a longer 118-in. wheelbase with a one-ton payload capacity and gross weight of 5,300 lb., the truck is powered by a 4-cylinder, 60-hp. engine

Progress of Diesel Locomotives Shown Graphically at AAR Exhibit

ATLANTIC CITY — Diesel locomotives took the spotlight as 10,000 members of the mechanical, stores and purchases division of the Association of American Railroads gathered at a convention here June 23-28. Exhibits were valued at $10 million. Those attending are expected to buy better than half a billion in new railroad equipment this year.

When AAR met last in 1937, a lone diesel locomotive appeared among steam locomotives at track exhibits. In the intervening 10 years, steam has been crowded off the tracks. There were nine diesels on display but not one conventional steam locomotive.

Steam's Lone Representative

Steam's only representative was an incomplete, coal-fired, turbine-electric job built by Baldwin Locomotive Works for the Chesapeake and Ohio. Baldwin hopes this unit will achieve 10-11% efficiency.

Conventional, coal-fired steam generation develops power through the 6,000 hp., non-condensing impulse type turbine. The generator drives 8 traction motors and 100 mph. is expected. The C&O also has 10 conventional steam locomotives on order with Lima and Baldwin. Other than that, there are no steam road locomotives on order for domestic railroads, but foreign orders are on hand.

Both Baldwin and American Locomotive Co. are establishing production lines for diesel electric locomotives. They and Electro Motive Division of General Motors average close to a year's backlog of orders. Newest thing in diesel electrics is the application of turbo-supercharging to diesel engines.

Improved Accessories Shown

For the conventional steam field, there were many improved accessories. The electrically welded steel boiler has at last been approved by ICC and will simplify maintenance.

Biggest job facing car builders is the freight car shortage. Railroads need 600,000 new freight cars. Car builders hope to produce nearly 5,000 units in June, and believe they will deliver 10,000 per month by September.

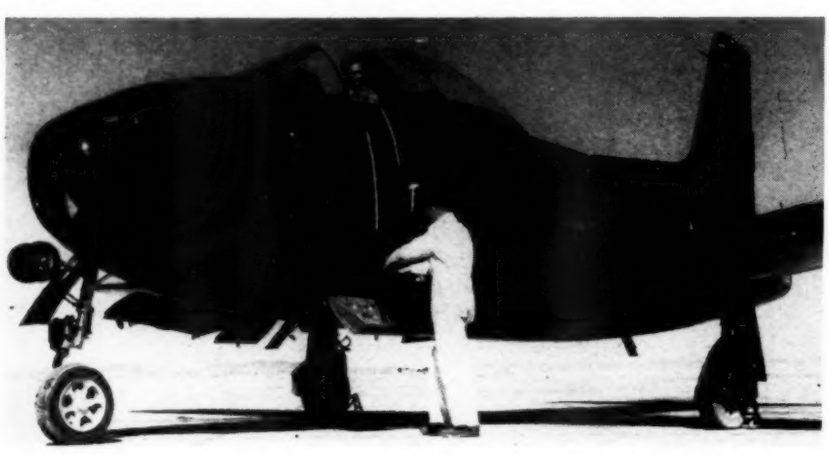
Trend in freight car design is two-fold. Better ride control through improved truck design is the most obvious. All freight car truck builders offer some type of ride control to snub rebound action. Tests prove that good ride control will reduce damages to livestock and other cargo so that a 40% reduction in lading damages may result. Second effort is toward installation of roller bearings to raise freight train speeds. The cost ($1,200 per car) is holding this back.

Mechanical Loading Pushed

One significant item has been development of equipment aimed at mechanical loading of freight cars. These include palletizing and use of fork lift trucks that can reach deep inside a box car.

Glamor queen of the show was General Motor's "Train of Tomorrow." (See *AM* June 19, '47, p. 160, and July 3, '47, p. 123). Passenger cars generally are becoming more luxurious. Modern lighting, wide windows, filtering air-conditioning systems and pleasing interior decoration are increasingly evident.

Less visible, but more important, are sound-proofed bodies, shock resistant draft gears, shock-free brakes, trucks with ride control devices, tight lock couplers and roller bearings. Builders expect to produce a 100,000-lb. car within five years.



Kneeling Fighter, North American Aviation's 550 mph. all-jet SFJ-1 features a bending nose gear independent of main gear with two telescopic kneeling cylinders attached to gear shock strut. Able to kneel on crowded carriers, new racer is first U. S. jet fighter to use single straight ram duct with nose entrance

Harsh Criticism of WAA May Lead To Ouster of Littlejohn, Staff

WASHINGTON — Gen. Robert R. Littlejohn may soon resign as a result of sharp attack by the House Surplus Property Subcommittee on his administration of the War Assets Administration.

This means that new machine tool and other dispersal programs will soon be set up by a new Administration and most or all of the existing programs will be abolished.

Chances are that President Truman will appoint an Administrator of business experience, as the Committee demands, and that all of the 90-odd colonels and generals on Littlejohn's staff will be out. The job has been offered to Housing Expediter Frank R. Creedon, former WPB and WAA official.

Report Lashes Program

The committee's 57-page report lambastes the entire WAA program as inept, inefficient, and negligent. All five members signed the indictment, but the chairman, bombastic Ross Rizley (Rep., Okla.) is reported playing for headlines and veterans' votes. He gives next to no credit to Littlejohn, a distinguished Army officer, and fails to notice that the surplus property job, by its nature, cannot be done in an "orderly, efficient manner."

Surplus disposal including the huge volume of machine tools still in stock, may be vastly improved, but it will still be a pain in the neck.

Littlejohn Answers Critics

In answering his critics, Littlejohn said: "The American public is being asked to believe that the Surplus Property Program has been unsuccessful. That is not so!"

In citing accomplishments of the disposal program, the Administrator said that of $35 billion in government property left over from World War II, approximately $18 billion has been sold to American veterans, industry, and business.

He said that as a result of disposal, $2,485,000,000 is in the Treasury, with the prospect that on or before June 30, 1948, the program can be liquidated entirely or reduced to a relatively small residue without disturbance to our national economy or interference with reconversion to peacetime operation.

Washington

SURPLUS ASSETS RULE TO STAY . . . SUBSIDIES ON NON-FERROUS METALS REMOVED . . . RFC'S POWERS LIMITED

Treasury's "Fishing" Clause

Treasury will take no early action on demands by some machine tool and other manufacturers for amending Section 102 of Treasury regulations, which provides that if 70% of surplus assets are not distributed, or reasons given why not, the company's records will be subject to scrutiny, with a view to penalties.

Inclusion in last tax return of a question on accumulation of surplus apparently was a Treasury effort to simplify its work, but it set off a flurry of excitement among manufacturers. Only chance for a remedy will be convincing arguments against Section 102 before Congressional Committees studying revision of the whole tax structure in 1948.

Joint Action Urged

Efforts by both business and military groups in the U. S. and Canada toward joint mobilization and standardization of production, inevitably involve Britain and to that extent slow down the process.

At the same time, these cross-border moves tend to pull the three countries together in a broader cooperation. Chambers of Commerce of the U. S. and Canada have issued a report titled "Combined Board and Joint Agencies of Canada and the United States," reviewing the joint efforts of the two nations, and recommending preservation of records and further meetings.

Gifts Might Pay Dividends

Probable passage by Congress of the Inter-American Military Cooperation Act, authorizing the U. S. to sell and transfer munitions to South American countries, at a cost of about $10 million, will establish U. S. models and standards in neighbor countries, create later markets here.

Briefly, it means bigger hemisperical armed forces, all using U. S. equipment. Under the bill, transfers by the U. S. would be: (1) sales of new equipment at cost; (2) sales from service stocks at adjusted prices; (3) shipments from surplus at token prices. U. S. would take in exchange, European munitions now in use, expecting to put makers out of South American business.

Army-Navy Merger Revived

The so-called Army-Navy merger bill has been revived on Capitol Hill and may be passed by this session. Actually, merger aspects of the bill are debatable. Army Air Forces, grown powerful during the war, got the independent command it wanted, and pulled out of the fight. That left the Army on the short end of the Navy lobby. The merger does provide a civilian National Security Resources Board, patterned on the wartime WPB, to plan industrial mobilization. The real merger battle still hangs fire for the future.

Non-ferrous Subsidies Off

Subsidies on copper, lead, zinc went off and all premium-paid mines went on their own for awhile, beginning June 30. Lead and copper prices are believed high enough to sustain production. Subsidized copper has dropped from a high of 34¢ to 5¢ in recent months.

Big government stockpiles and imports of zinc are available, but the price may rise from 10.5c to 12c, which would save marginal producers. Republican leaders pigeonholed the Russell Bill, which would have extended the metals subsidy system, and set up another one, the Leo Allen bill, which probably will pass, authorizing $70 million in premiums for two years.

Freight Car Exports Checked

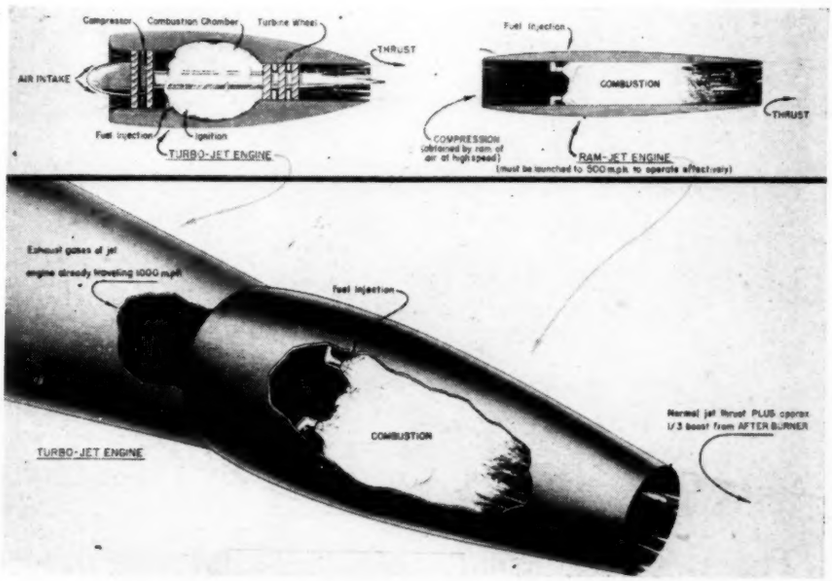
Now that freight cars have streamed through export channels for months, seriously crippling rail cargo service and many shippers, Office of International Trade (Commerce Dept.) and Office of Defense Transportation, have set up an order requiring exporters to get licenses from OIT.

But the bulk of exports to France, Netherlands, Belgium and other countries, and through UNRRA, have been completed, and the order will have little effect. State Department allowed the exports because it felt rehabilitation of devastated countries took priority over needs at home.

RFC's Status Altered

The Act of Congress continuing RFC to June 30, 1948, reinstates its authority to purchase real and personal property for vets and other small business, a function stopped months ago in response to opinion of the Controller General.

RFC's borrowing (and therefore lending) power is drastically reduced from about 18 to 2 billions. The agency formerly could sell its paper on the market, but now must borrow from the Treasury. Only two subsidiaries: U. S. Commercial Co., which purchases products of Germany and Japan, and the National Mortgage Association, are continued. Republicans probably will abolish RFC's functions next time, but they'll have to leave a skeleton to administer its long-term loans.



Jet-engine Thrust is boosted tremendously by the Ryan "After Burner," shown here in an artist's conception. It offers extra speed and power to the already cyclonic force of searing gases blasting the tailpipe nozzle of jet propulsion engines. Added thrust of After Burners will give more power to take-off, and assist planes in breaking through compressibility barriers

West Coast's Major Aircraft Firms Curtail Employment, Remain Active

LOS ANGELES—Aircraft manufacturers here are gradually making their way back to industrial stability after the sharp end-of-war contraction of their profitable though strenuous military market.

The "big four"—Douglas, Lockheed, North American and Northrop—have withstood readjustment to postwar operations better than smaller companies because of their previous economic condition. Employment, however, has been slashed to less than one-fifth the wartime peak of 350,000.

Firmly entrenched in commercial plane operation prewar, Douglas continues to be the largest producer of commercial types in this area. All manufacturing facilities at its main Santa Monica plant are concentrated on producing the 52-passenger DC-6.

The DC-6 has a uniform diameter fuselage to which alterations in length can be made either fore or aft of the wing. Present manufacturing schedules call for completion of 150 of these planes and represent major business of the Douglas factory.

Experimental Work Performed

Other Douglas activities center on experimental engineering and development work on military aircraft. The El Segundo plant is working on the AD-1, a carrier-based fighter and bomber carrying a 6,000-lb. bomb load and capable of great speed.

The Sky Streak, a single jet version of the jet-propelled plane, had its initial test flight early in June at Muroc Dry Lake. The XB-43, a twin jet version of the XB-42, is also nearing completion. One Douglas unit is engaged in an extended program on development of guided missiles.

In diversification, Douglas is building a series of small sportsmen's boats. A project for turning out precut housing units was abandoned before actual production got underway. Its revival is questionable.

Lockheed Aircraft Corp., repeatedly avowed to confining itself to aircraft construction, lists only a few accessory items in its production schedule.

Turns Out Constellations

Concentrating its activities to the plant bordering its air terminal in Burbank, Lockheed's employment has dropped from 94,000 to 14,000.

The firm is currently producing the Model 649, better known as the Constellation. It is also turning out the P-80 Shooting Star, an AAF jet-propelled fighter, and limited quantities of PV-2 Neptune, a Navy long-range land-based patrol bomber.

Lockheed's newest plane is the 92-ton, 180-passenger Constitution, a long-range, cargo-transport built for the Navy. Two of these ships will be delivered soon.

The accessory, equipment and repair branch is making airplane jacks, aerostands, aeroramps, and services all types of aircraft. A high-speed gas turbine airplane power plant is currently under development.

Research developments include a new "brush anodizing" process for protection and finishing of aluminum and its alloys.

North American Expands

North American Aviation Corp.'s plant is expanding in both size and equipment. It is confining its operations to military aircraft. Employment has shrunk from 90,000 at three plants to 13,500 with about 15,000 expected to be located in one main plant.

Production involves the new B-45-JB, a four-jet plane for the AAF; the P-82, a Twin Mustang, long-range fighter, and the XFJ-1, a carrier-based jet fighter for the Navy.

In development, but without a production contract, is the XSN2J-1, still entirely experimental. Another experimental model not yet in production is the P-86. North American also is engaged in a research and development program for pilotless missiles.

Northrop Aircraft Corp., smallest of the "big four" in employment, has dropped from 10,000 to 5,100 in one main plant at Hawthorne.

A pioneer in Flying Wing types, Northrop is producing such planes and expects to test two jet-propulsion types in August.

Diversification at Northrop

Northrop has diversified, however, and is producing a new type motor scooter at the rate of 1,000 a month. Northrop is a leader in the field of scientifically designed artificial limbs. Three firms are producing the artificial limb under Northrop license and supervision.

Another division is developing a Turbodyne engine which combines an internal combustion engine with jet propulsion. Experiments are in progress with cooperation of Union Pacific Railroad to develop the Turbodyne for locomotive power plants.

Several of the smaller companies are active in diversified fields, and some newer plants have been moved to the Coast from the East for aircraft production.

Mission Achieved: Top Metallurgist

HAWTHORNE, CALIF. — A recognized expert in her chosen profession, Rebecca H. Smith overcame the conventional "It's a man's job," to become chief metallurgist for Northrop-Hendy Co.

Her job is generally believed to be one of the most difficult now held by any U. S. metallurgist, since she must test and specify all the new alloys which go into the Northrop-Hendy Turbodyne. Exacting specifications require daily pioneering in the field of new metals and new applications. She has been working at her profession 16 years.

Mrs. Smith is shown using a Rockwell hardness tester in checking metal. By measuring the load required to indent the metal, Mrs. Smith can estimate the tensile strength of the metal and can tell if it was properly heat-treated. The name "R. H. Smith" on a blueprint or a technical paper is well known — and respected.

Joint Study Group May Strengthen Featherbedding Rule in Labor Bill

WASHINGTON — The Taft-Hartley labor law doesn't do some things management may think it does. Nor does it do all the things for which union leaders criticize it. An example is the ban on featherbedding.

Actually, this law does not stop what has come to be accepted as featherbedding: employing more men on a job than are needed; insisting on certain unnecessary operations; resistance to labor-saving devices; limitation on production; insistence by AFL electrical workers in New York, for instance, on dismantling and reassembling fabricated equipment shipped in from outside New York.

All the Taft-Hartley law does is make it an unfair labor practice for a union to try to force an employer to pay, "in the nature of an exaction, for services which are not performed."

Emphasis on Catch Words

The key words are "exaction" and "services . . . not performed."

Charges that this provision would prevent unions from insisting on such commonly accepted practices as paid rest periods, call-in pay when the worker appears as scheduled and isn't needed, pay for union stewards while handling grievances and even portal-to-portal pay, were answered by Sen. Robert A. Taft in Senate debate on the bill.

Taft pointed out that payments for such activities were not "exactions" and thus permissible. The conferees who framed the final bill, he explained, had in mind pay for work not performed which "borders definitely on extortion."

Taft cited Petrillo's insistence on payment, say, for 10 musicians when a night club proprietor may have room for only six, as an example of the type of featherbedding provision that law aims at. In other words, the new law would not apply if the proprietor actually received services from the 10 musicians although he wanted only six. Although Taft was talking here of musicians, the analogy would apply equally as well to the factory or shop.

Featherbedding Modified

The House bill would have defined and made illegal five types of featherbedding, but the Senate-House conference agreement retained only the one which now appears in the law.

As the law stands, if services are performed, it is not an unfair labor practice, even though the employer feels that the "services" are unnecessary or that fewer workers could provide the same services.

Senate leaders felt Congress was unprepared to draft general legislation on featherbedding. This is one of the subjects which will be delved into by the new joint Senate-House labor study committee. Legislation covering other aspects of featherbedding may come in the future.

Exceptions on Closed Shop

The Taft-Hartley law's ban on the closed shop won't apply to old contracts until they expire and those signed in the 60 days before Aug. 22 may include the closed shop if they do not run for more than a year.

The rule is different, however, as to the checkoff and union welfare fund contributions. Restrictions on these provisions go into effect upon expiration of a contract *but in no case later than next July 1.*

MANAGEMENT WILL LIKELY PASS THIS PRIVILEGE UP

WASHINGTON — While supervisors are denied bargaining protection under the Taft-Hartley law, they are free to join unions and to bargain with management if management is willing.

However, any management which deals with a union of supervisors should be aware of the risk involved. Neither side has recourse to the Taft-Hartley law. Neither side can avail itself of its protection or be subject to its penalties.

Both sides are bound only by the terms of their contract. Management, for example, cannot rely on the new law to sue a supervisors' union for breach of contract.

Left out in the cold, the Foreman's Association of America now wants to affiliate with the CIO or AFL.

NEW NLRB MAY FEATURE REYNOLDS AS "SWING MAN"

WASHINGTON — When the National Labor Relations Board is enlarged from three to five members, James J. Reynolds, Jr., an incumbent and frequent dissenter against his two colleagues, may become the "swing man" in the new five-man setup.

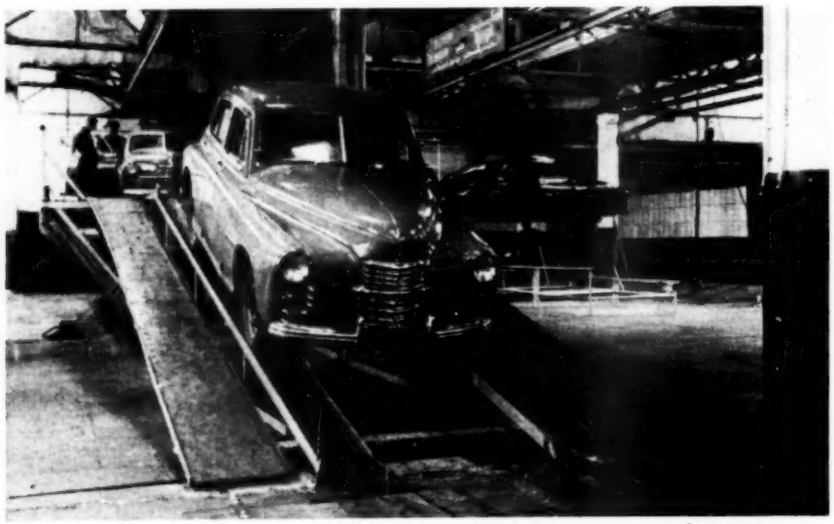
He thinks the Taft-Hartley law can work. Although only a freshman of less than a year on the board, four of his dissenting views have been incorporated, at least in part, in the new law.

Brother of the more famous Quentin Reynolds, James J., Jr., left the New York Stock Exchange to work as a day laborer in the Bessemer (Ala.) foundry of U. S. Pipe & Foundry. He worked as foreman and director of labor relations before becoming assistant to the president. He came out of the Navy a commander.

Biggest English Press for stamping auto bodies was recently inspected by officials of British Light Steel Pressings Co. which will use the press to stamp bodies for Hillman and Humber motor cars. A Clearing triple-action press built by Vickers-Armstrong, Ltd., the press delivers 1500 tons pressure at one stroke and is capable of 300 strokes an hour, with a total of 140 hp. It can form in a single piece the entire side, roof or rear portion of the body with window openings pierced and shaped in a single operation

Foreign Report

(BASED UPON REPORTS FROM McGRAW-HILL WORLD NEWS BUREAU)



Russian Auto, Pobeda, rolling off the assembly line of the Molotov Works

Soviets Spur Auto Production

MOSCOW — Automobile and truck production is reaching new heights in Soviet Russia. With its annual output goal set at 500,000 motor vehicles by 1950, the Soviet auto industry will turn out this year many more cars than it did before the war, and 57% more than in 1946.

Emphasis is on truck production. The 1950 production plan calls for 428,000 trucks, 65,600 passenger cars, and 6,400 buses.

Before the end of this year, mass production of new models, including five trucks and three light cars, all designed during the war, is to be organized at the four existing automobile plants (two in Moscow, one in Gorki and Yaroslavl) as well as at two new plants—Dnepropetrovsk (Ukrane) and Kutaisi (Caucasus) which are to start operating this year.

Diesel-powered Trucks

In 1948, production is to start on new 3½-ton two-axle trucks, with diesel engines. New buses are 34-seater wagon type, with diesel or gasoline engines and electric transmission. A smaller 16-seater bus will also be turned out.

Output is to be increased considerably this year of 1-ton and 3-ton self-discharging trucks, and preparations are in progress for production of 5-ton self-discharging trucks at the Minsk automobile plant which is now under construction.

To cope with the program, the Soviet automobile industry is undergoing a vast expansion, involving reconstruction and extension of existing plants and construction of new facilities.

Quotas Set for Gorski

The Gorski plant, largest in the country, is being doubled in size, and is scheduled to produce in 1950 as many as 1,000 trucks and light cars a day.

The "ZIS" plant in Moscow is to increase its capacities 2½-fold before the end of 1948, and is to turn out during five years a total of 373,000 motor cars, bringing its annual output to 100,000 cars in 1950.

The Yaroslavl plant will specialize in production of heavy 5- to 7-ton trucks with diesel engines. Before the end of 1950, this plant is to start turning out 12-ton, three-axle trucks which are in design at present.

New Machine Tools Needed

Considerable machinery and equipment will be procured during the five-year period. An estimated additional installation before the end of 1950 of about 35,000 pieces of machinery and other equipment, including at least 5,000 multiple-head and specialized machine tools, many presses, hammers, forging machines and various foundry equipment will be obtained.

Machinery at old plants is being modernized, with a view to going over completely to automatic and semi-automatic machine tools. More than 28,000 various devices, 25,000 dies, 75,000 types of cutting tools, 40,000 types of gages, and hundreds of patterns are being produced for the new-type automobiles.

During the five years, productivity of labor in Soviet auto plants is scheduled to be increased 45%. Incentives in the form of better working and living conditions are being offered.

Die-pressing processes in producing various parts are being replaced by iron and steel casting. Centrifugal iron and steel casting process is being introduced widely, and pressure casting of non-ferrous metal alloys and steel is to be extended.

Indian Machine Tool Tariff

BOMBAY, INDIA—India's machine tool requirements were estimated at nearly $25 million annually, compared with domestic production having an annual value of about $4½ million, it was revealed at an Indian Tariff Board hearing on a petition by Indian manufacturers for a protective duty.

Industry representatives admitted high duties might have bad effects on India's current needs for industrial development, but asserted the 10% revenue duty now imposed is too low.

They countered with a proposal that a "price preference" of 15% be established and that the Controller of Machine Tool Imports be directed to refuse import licenses where it could be shown the unit sought could be bought in India for a price less than 15% above the foreign unit cost.

The Board indicated, however, it was unconvinced of a need for change in the present system.

Australian Aircraft Operations

MELBOURNE—Australia is determined to maintain its wartime aircraft plants in standby condition. Sufficient orders are coming through to warrant skeleton staffs in the four major aircraft plants. Construction and development work will keep the staffs occupied for many months.

Gradual displacement of wartime models by postwar designs, including jet-propelled craft, calls for extensive retooling at several plants.

Commonwealth Aircraft Corp. continues importing engines from the U. S. Other large companies operating are: Beaufort Division, Department of Aircraft Construction; Lidcombe Government Arsenal; and De Havilland Aircraft Co.

Names in the News

WAA Office Renews Program For Donation of Machine Tools

CLEVELAND — The regional War Assets Administration office here recently offered, free of cost, millions of dollars' worth of metalworking machine tools to 6,000 instrumentalities of federal, state and local governments and tax-exempt non-profit educational and charitable institutions.

A circular gives complete descriptions of the machines and procedure for obtaining them. The first list included 275 items of tools and machines held in long supply and available.

All of the machines have been offered to priority claimants and commercial buyers without takers. All orders received by WAA in this giveaway deal will be on a first come, first served basis with the donated machines and tools on an "As is" basis, f.o.b. the shipping point.

Donees to Pay Freight

Donees are responsible for freight charges as well as costs involved in skidding, packing or crating. The machines can be inspected at WAA warehouses.

This new effort is a follow-up on a plan announced more than two years ago, whereby schools and colleges (technical) were permitted to acquire from surplus, machines needed upon payment of 5% of the machine's original cost.

A number of large Eastern and Mid-western technical schools re-equipped their shops with late models taken from surplus. They could afford to obtain the equipment, and had manpower to locate and obtain specific items.

Many schools and institutions, however, needed the machine tools but were not in a position to obtain them. Even the nominal 5% of the original cost was too much, let alone the cost of locating wanted machines and transporting them to the schools.

Many Machines Available

While surplus machines now available for donation have been culled by priority claimants and commercial buyers, there are still hundreds of machines, WAA officials believe, which can be of use to institutions needing equipment.

On the new list, and free for the taking, are drilling machines, gear-cutting machines, cylindrical grinders and a long group of "freak" or off-standard machines which were designed for special purposes in war work.

Obviously there are but two remaining places for those machines which are not taken on this donation offer: (1) into JANMAT and held for a national emergency, or (2) to the scrap pile.

George A. Custer George D. Pence

George A. Custer has been elected vice president in charge of manufacturing of the Peninsular Grinding Wheel Co., Detroit. He has been with Peninsular for 10 years as factory superintendent and chief engineer.

George D. Pence has been appointed president of Wilson Foundry and Machine Co., Pontiac, Mich. He was formerly director of special activities at Willys-Overland Motors, Inc.

Edward P. Geary has been elected vice president and general sales manager of Atlas Steels, Ltd., Welland, Ont., Canada. He will supervise all commercial activities, including domestic and export sales.

New Tractor Engine Forebodes Savings in Cost of Diesels

CHICAGO—International Harvester foresees important savings in diesel engine costs from the new diesel tractor engine the company has perfected. The new engine, made up largely of standard gasoline engine parts, can be made on the same production line with gasoline engines.

In addition to cutting the cost of diesel engines (now some 50% more expensive to manufacture) the new development will also mean a weight saving of roughly 20% in diesels, and standardized parts will simplify servicing.

Pipe Destined for Saudi Arabia Will Take Two Years of Shipping

MAYWOOD, CALIF.—Consolidated Steel Corp. will soon begin shipment of 1 million tons of 30-in. and 31-in. steel pipe from Long Beach to Saudi Arabia. The pipe will be used for the 1,000-mile line from the Persian Gulf to the Mediterranean.

Making the largest single ocean shipping job in world history, the shipment will require the services of 30 to 50 ships for two years. Plates from which the pipe is being fabricated originated at the U. S. Steel Corporation's Geneva plant.

MAGNESIUM ASSOCIATION FOUNDER HONORED

QUEBEC — In recognition of his work during the formative years of the group, Edward S. Christiansen, founder and first president of the Magnesium Association, was presented with a plaque at the recent meeting of the association at the Seigniory Club, P.Q., Canada. Mr. Christiansen, president of The Magnesium Co. of America, Chicago, was praised by R. D. Taylor, association president, for his efforts in behalf of the association.

Thura A. Engstrom has been elected vice president and factory manager of the Muskegon Div. of Continental Motors Corp., Muskegon, Mich. Mr. Engstrom has formerly served as production manager, chairman of the labor relations committee, and acting factory manager.

Edward L. Keenan has been elected vice president and general manager of Glenn M. Rogers, Inc., Buffalo, producer of farm machinery. He was formerly vice president and general manager of the Farnham Manufacturing Co., Buffalo.

Lorne F. Lavery has been named manager of the Detroit office of the New Departure Div., General Motors Corp. and **Charles D. McCall** has been named manager of automotive sales with offices in Detroit.

Harold L. Hoefman has been elected vice president in charge of manufacturing of the Link-Belt Co., Chicago. Mr. Hoefman, who has been with the firm 27 years, has been succeeded as general manager of the company's Pershing Rd. plant by **David E. Davidson. Robert C. Becherer** has been appointed plant manager of the Ewart plant, Indianapolis.

Arthur Dressel, general sales manager of R. Hoe & Co., Inc., New York, has been elected senior vice president.

John M. Diebold has been appointed northern Ohio representative for The Precision Welder and Machine Co., Cincinnati, with offices at 1921 East 55 St., Cleveland.

E. C. Koster, vice president and general manager of the Vlchek Tool Co., Cleveland, has been elected president and general manager, succeeding the late F. J. Vlchek, founder of the firm. **Henry F. Vlchek,** former treasurer, has been elected vice president.

Oliver F. Gang has been elected president, director and general manager of Ludlow Valve Co., Inc., Troy, N. Y.

Joseph J. Mayer, general superintendent for the past 10 years, has been elected a vice president and director of Lumen Bearing Co., Buffalo, succeeding the late C. H. Bierbaum.

Louis J. Rohl has been appointed chief metallurgical engineer of the Carnegie-Illinois Steel Corp. He succeeds **E. T. Barron,** who has retired after 42 years with the U. S. Steel subsidiary.

James H. Wolcott has been named manager of the West Coast office in Los Angeles of Reed-Prentice Corp., Worcester, Mass.

Harold A. Hintz has been named Pacific Coast sales manager for the H. K. Porter Co., Inc., of Pittsburgh, with headquarters in the Petroleum Bldg., Los Angeles.

George L. Nunn has been appointed southern Connecticut sales engineer of the Austin-Hastings Co., Inc., Machinery Div., Cambridge, Mass. with offices in New Haven.

Gilbert A. Bunn has been named district manager of the Philadelphia area for Kennametal, Inc., Latrobe, Pa., with headquarters at 3701 No. Broad St.

Alfred W. Schultz has been named director of production and planning control for the Warren City Manufacturing Co., Warren, Ohio.

BUSINESS ITEMS

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has formed a turbo-power development department in its engineering development division, with **R. C. Allen,** former head of the steam turbine department, as manager and chief engineer.

Carboloy Co., Inc., has appointed the Sioux Machinery & Supply Co., 315 W. Seventh St., Sioux City, Iowa as its authorized distributor in northwestern Iowa, South Dakota, and northeastern Nebraska.

Kennametal, Inc., Latrobe, Pa., has appointed **Lundwall & Co.,** V. Hamngatan 5, Goteborg as its distributing representative in Sweden. **Laurent Industrial Development Co.,** New York, has been named exclusive sales representative for Kennametal mining tools in France, its empire, protectorates and mandates; the Saar; Spain and Italy.

Cressell Stainless Steel Co., has been established as a sales service engineering firm at 333 No. Michigan Ave., Chicago, by **Edward G. Cressell.** He was formerly Chicago district manager of the Geary Stainless Steel Co., Baltimore, Md.

Carnegie-Illinois Steel Corp. has combined its sales units under the direction of **Griswold A. Price,** manager of the Chicago district sales office. **Edward W. Backes** has been appointed railroad industries sales manager; **John H. Morava,** manufacturing industries sales manager; and **George O. With,** construction industries sales manager.

Kelsey-Hayes Wheel Co., Inc., Detroit, has purchased the **Lathan Co., Inc.,** South San Francisco, manufacturer of power brake equipment. Lathan will continue manufacturing in South San Francisco, but its Chicago warehouse, assembly and branch units will be moved to Detroit.

The Charles L. Jarvis Co., Middletown, Conn., has acquired the **Dowding Div.,** of the **Henry L. Hanson Co.,** No. Attleboro, Mass., manufacturers of taps and dies. Distribution of Dowding products will be on a national basis as a division of Jarvis.

G.H.W. Machine Co., Inc., Binghamton, N. Y., has been incorporated with a capital of $100,000 as a general machine shop by **Glenn H. Weldy, Jr., James H. Larkin, Sr.** and **Louis M. Greenblott.**

OBITUARIES

Harry A. Maurer, 70, former general superintendent, director and secretary of The Oster Manufacturing Co., Cleveland, passed away June 17. He joined Oster in 1905 and retired from active duty a year ago, remaining in a consulting capacity.

Harry A. Porter, 68, regional sales manager for Century Electric Co. in the Chicago area, died suddenly June 9. He had been connected with Century since 1910 as sales agent, Chicago district sales manager, and Chicago and Northwest regional sales manager, successively.

William L. McGrath, former general manager of the Eclipse Machine Div. of Bendix Aviation Corp., in Elmira, N. Y., died recently after a long illness. He had been a vice president of Bendix for 18 years.

John C. Kennedy, 59, vice president and works manager of the Kennedy Valve Mfg. Co., Elmira, N. Y., passed away recently.

Leon F. Payne, 63, treasurer of the Carnegie-Illinois Steel Corp., died June 22. He was affiliated with units of the U. S. Steel Corp. for more than 35 years.

Christopher H. Bierbaum, 83, vice president and consulting engineer in charge of research for the Lumen Bearing Co., Buffalo, died June 15. He had been with the company since 1901.

Benjamin L. McCarthy, 51, chief metallurgist of the Wickwire Spencer Steel Division in Buffalo, died recently. He had been associated with Wickwire for 30 years.

George M. Walton, 60, president of the Madison Foundry Co., Cleveland, passed away June 28. He joined Madison 44 years ago and later served as secretary, vice president and, since 1942, as president of the firm.

Albert E. Lange, Sr., president of the Lange Pipe & Supply Co., Pasadena, Calif., died June 11.

Walter H. Curry, 58, vice president of the Galigher Machinery Co., Salt Lake City, Utah, died recently.

MEETINGS

American Society of Mechanical Engineers. Fall meeting. Hotel Utah, Salt Lake City, Utah. Sept. 1-4. Ernest Hartford, executive assistant secretary, 29 W. 39 St., New York.

Instrument Society of America. Annual conference and exhibit. Hotel Stevens, Chicago. Sept. 8-12. National office, 1117 Wolfendale St., Pittsburgh.

Machine Tool Congress. Evening meetings in conjunction with the 1947 Machine Tool Show of the National Machine Tool Builders' Association:

American Foundrymen's Association. Sept. 19.

American Machine Tool Distributors Association. Hotel LaSalle. Sept. 17.

American Society of Mechanical Engineers. Hotel Continental. Sept. 18 and 24.

American Society of Tool Engineers. Sept. 19.

Chicago Technical Societies Council. Sept. 23.

National Electrical Manufacturers Association. Palmer House. Sept. 22.

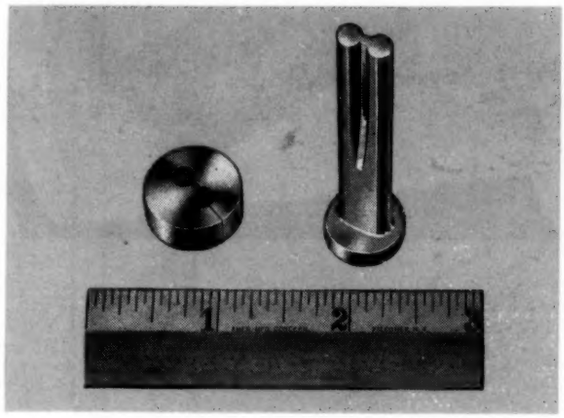
Society of Automotive Engineers. Hotel Knickerbocker. Sept. 25.

National Machine Tool Builders Association. Machine Tool Show. Dodge-Chicago plant, Chicago. Sept. 17-26. Tell Berna, general manager, 10525 Carnegie Ave., Cleveland.

SHEFFIELD MACHINE TOOL DATA

MFG—No. 114

CUT COSTS OF PROFILING TUNGSTEN CARBIDE TOOLS



Solid tungsten carbide punch and split type die were ground on the Micro-Form Grinder —16 hours for punch and 8 hours each for two die sections.

Die has .0005″ taper per inch and clears the straight punch by .0005″– Inspection proved all dimensions were held to better than customers' required tolerance.

Grinding was performed directly from 50-1 layout made on an engineer's detail glass. Work was ground and checked without being removed from the Micro-Form Grinder.

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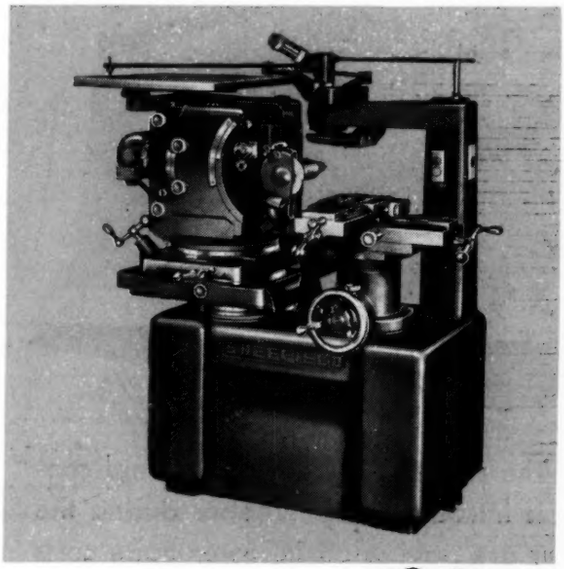
The Sheffield Micro-Form Grinder is especially suitable for the finish grinding of precision profiles on tungsten carbide. The small, relatively low cost, diamond wheels are not formed to any precise contour for the grinding operation—therefore, there is no waste.



See actual demonstrations at Sheffield Booth No. 202, Machine Tool Show, Chicago, September 17-26.

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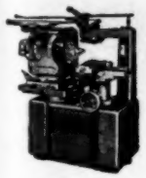

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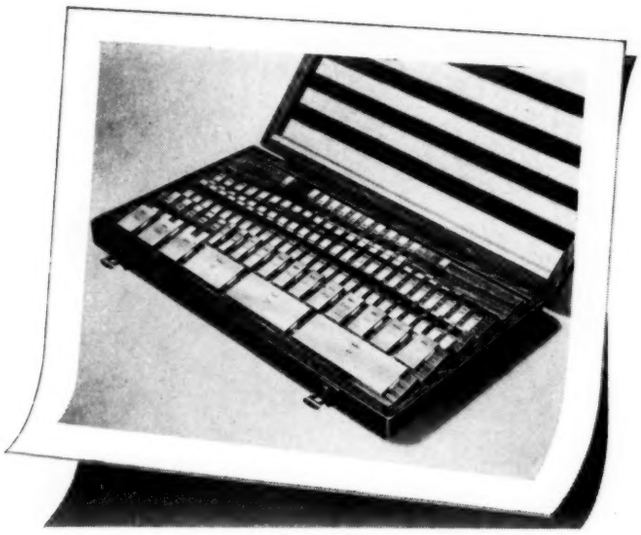
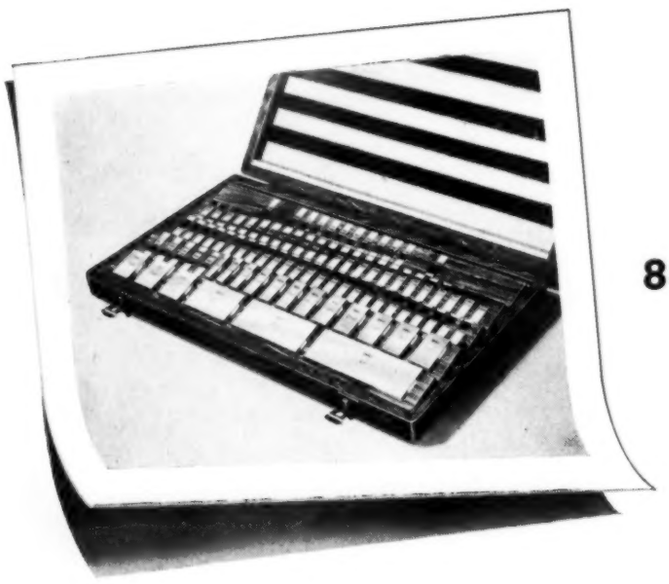
84 BLOCK SET—84A
±.000004"

~~$350~~ $295





WEBBER GAGE
84 BLOCK SET—84B
±.000008"

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The refinement and dimensional controls introduced by Webber during the war are paying off in lower gage costs today.

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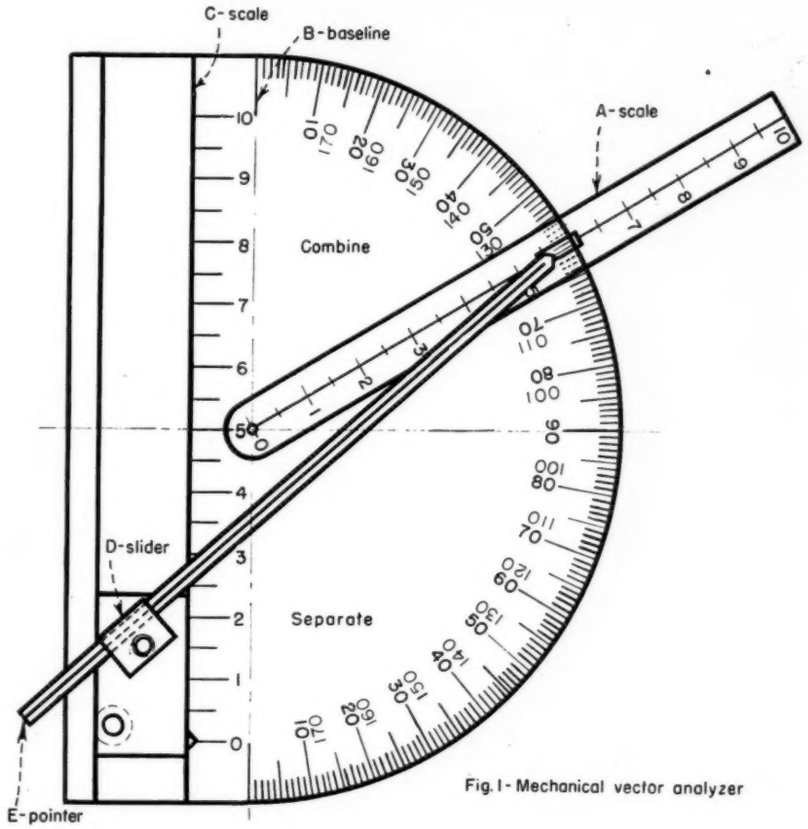


Fig. 1 - Mechanical vector analyzer

Calculators for Balancing Problems—I

By ROBERT HARTMANN

MANUFACTURING DIVISION, ALLIS-CHALMERS MFG. COMPANY

IN SEARCHING for more effective means to calculate the amount and location of weight correction when balancing high-speed rotating machinery, the Allis-Chalmers Mfg. Company devised two simple instruments—the mechanical vector analyzer and the polar balancing weight computor. These instruments provide the "answer" directly—and there is no need for paper and drawing instruments.

The usual method of machine balancing specifies the amount and angular location of necessary weight correction. In practice, the correction weight can not always be placed where the balancing machine indicates. The mechanical vector analyzer, Fig. 1, then serves to locate the amount to any desired angle or angles. This instrument will combine or separate weights as required.

Besides use with new spindles and rotors, the vector analyzer is useful on repaired rotors which must be rebalanced. Existing correction weights may be left in place, and the unbalance reading can be added or subtracted. Similarly, when a calibrated weight is placed on a rotor, an unbalance reading may be taken immediately after calibration is completed and without stopping the machine. The calibrated weight is then subtracted.

The mechanical vector analyzer consists of a protractor with scale *A* pivoted at the center and graduated from 0 to 180° from both ends of baseline *B*. This baseline and the parallel scale *C* are graduated from 0 to 10. Slider *D*, with an adjustable clamp to hold pointer *E*, is mounted to travel up and down along scale *C* and of course parallel to the baseline, or zero angle.

With scale *C* increasing in value from bottom to top, the combining of weights (or added forces) is figured from the zero angle at the *top* of the baseline, and separating of weights (of substracting forces) is figured from the zero angle at the *bottom* of the baseline. Additions and subtractions can be made for any angle up to 180°.

Adding Problem

Assume, two temporary weights separated by 60°; that is, a 5.0 oz. weight is located at 20° and a 3.0 oz. weight at 80°.

To add, Fig. 2, the zero end of the protractor scale is located at the top of the baseline, the end marked "combine." For convenience, select the baseline (0°) as the 20° angle. The 80° angle will then fall at 60° on the protractor.

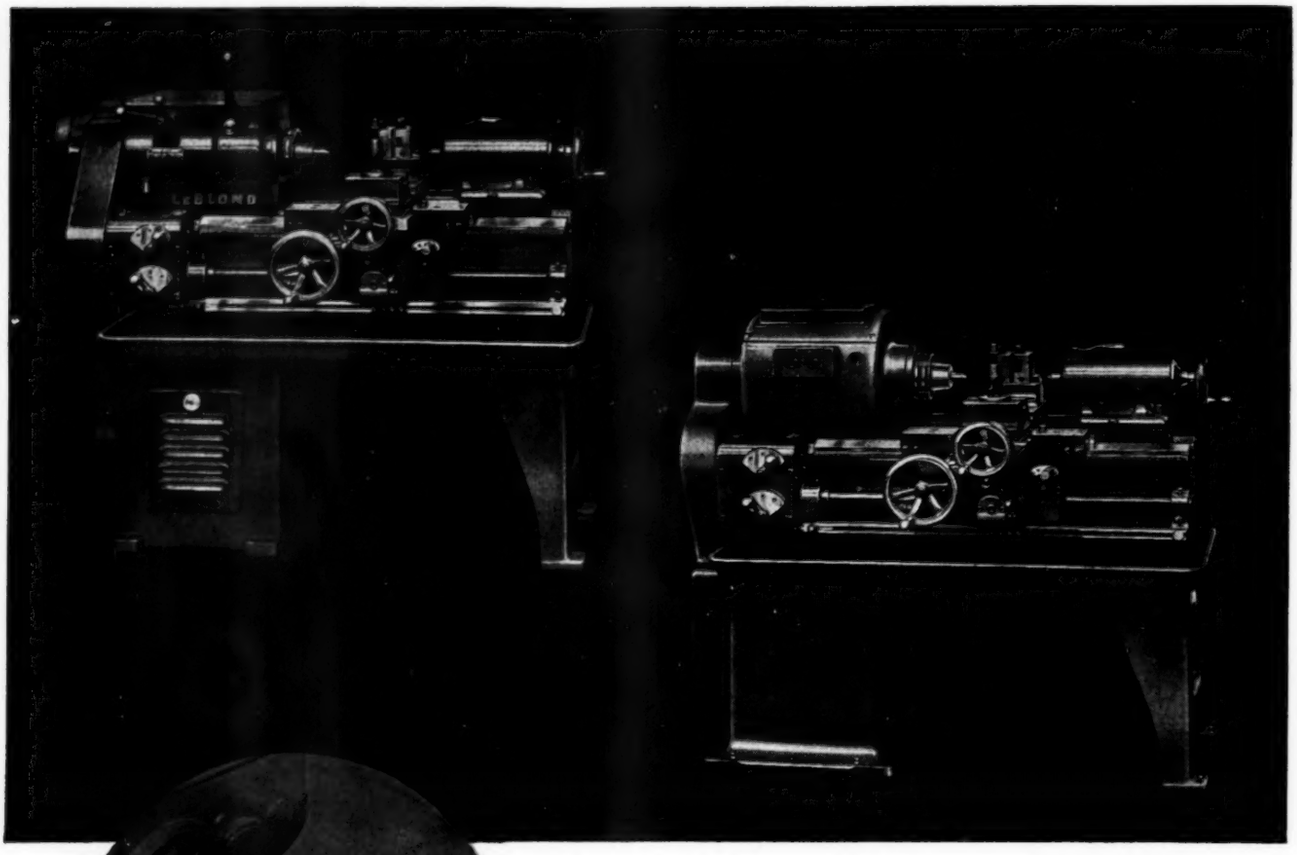
To operate the analyzer, set slider *D* to zero on scale *C*. Then set arm *A* to 60° on the protractor. Next set pointer *E* to the 3.0 on arm *A*. Then move slider *D* to 5.0 on scale *C* (shown dotted) and rotate arm *A* until pointer *E* again intersects the scale on arm *A*. The new reading of 7.0 on arm *A* is the amount of weight to be added, and the protractor reading of 22° added to the 20° assigned to the baseline, gives the new angle of 42° at which the weight must be added.

Subtracting Problem

Assume one temporary weight of 7.0 oz. located at 42° to be replaced by two weights, utilizing two existing bolt holes separated by 60°, and located at 20° and 80°, respectively.

To subtract, Fig. 3, the zero of the protractor scale is taken at the lower end of the baseline. Again for convenience, select the baseline 0° as the 20° angle. Then, the 80° angle again falls at 60° on the protractor. Also, the 42° angle of the 7.0-oz. temporary weight will fall at 22° on the protractor.

To operate the analyzer, first set slider *D* to zero on scale *C*. Then set arm *A* to 22° on the protractor and



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Rapid Production Lathes

RAPID PRODUCTION STANDARD FEATURES

- Flame hardened and ground steel bed ways front and rear.
- 3600 rpm maximum spindle speed on 13" Motor Head model.
- Wide variety of spindle speed ranges.
- Quick acting clutch and brake.
- One-piece apron with positive jaw feed clutch and one-shot lubrication.
- Multiple automatic length stops.
- Standard tapered key-drive spindle nose.

These speedy lathes are LeBlond precision built to produce fast, accurate metal turning. They're ideal for plain turning, facing, boring of aluminum, brass, bronze, magnesium, plastics . . . for any short cycle operation of seconds duration. Will perform standard ferrous metal turning as well. Flame hardened and ground steel bed ways now standard. Rapid Production lathes available in 3 sizes: 13" (with 3 optional headstock models), 17", and 20".

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USE OF MECHANICAL VECTOR ANALYZER

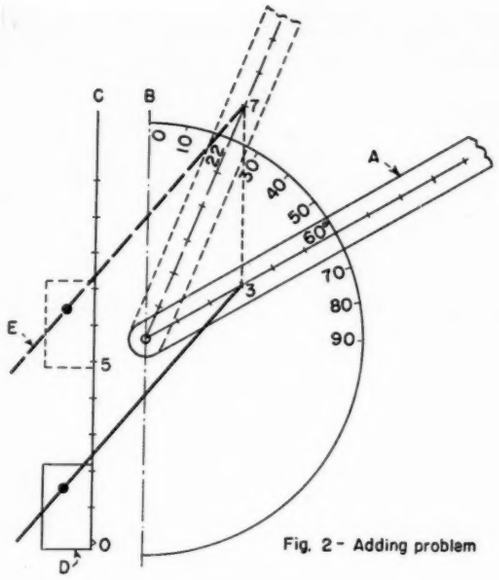


Fig. 2 - Adding problem

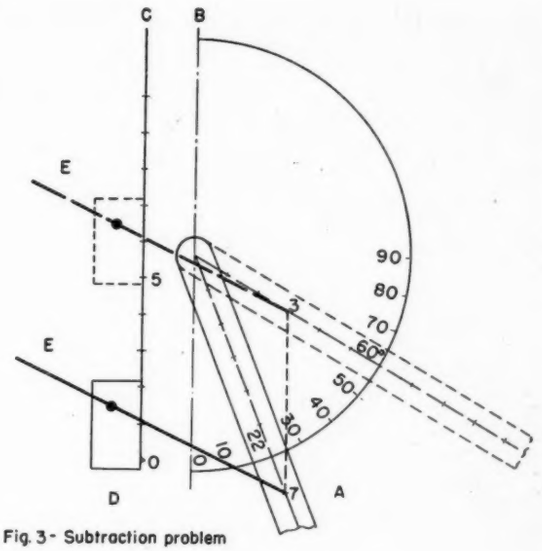


Fig. 3 - Subtraction problem

Calculators for Balancing Problems—II

the pointer *E* to the value 7.0 on scale arm *A*. Next move arm *A* to 60° on the protractor and the slider *D* up until pointer *E* again intersects the scale on arm *A*. The new reading of 3.0 on arm *A* will be the amount of weight to be added at 80° and the reading of 5.0 on scale *C* will be the weight to add at 20°.

After the amount and angle has been determined accurately, the usual procedure for unbalance correction is to place the center of gravity of the correction weight at a given radius. When the correction weight is a piece of circular weight stock, the correct amount to be used is determined by the polar balancing weight computor, Fig. 4.

The device consists of an arm *A* moving in an arc of 90°, controlled by link *B* attached to slider *C*. Pointer *D* moves up and down along line *E*, which is at right angles to the baseline *F*. With slider *C* in its lowest position, the centerline of arm *A* and link *B* will lie on baseline *F* and pointer *D* will be at the zero end of scale *S*. As the slider moves up, arm *A* moves away from the baseline. When pointer *D* reaches the top of scale *S*, the centerline of arm *A* and link *B* will fall on line *E*. Chord measurements are taken between baseline *F* and centerline of arm *A* at the desired radius, after pointer *D* has been set for a reading on scale

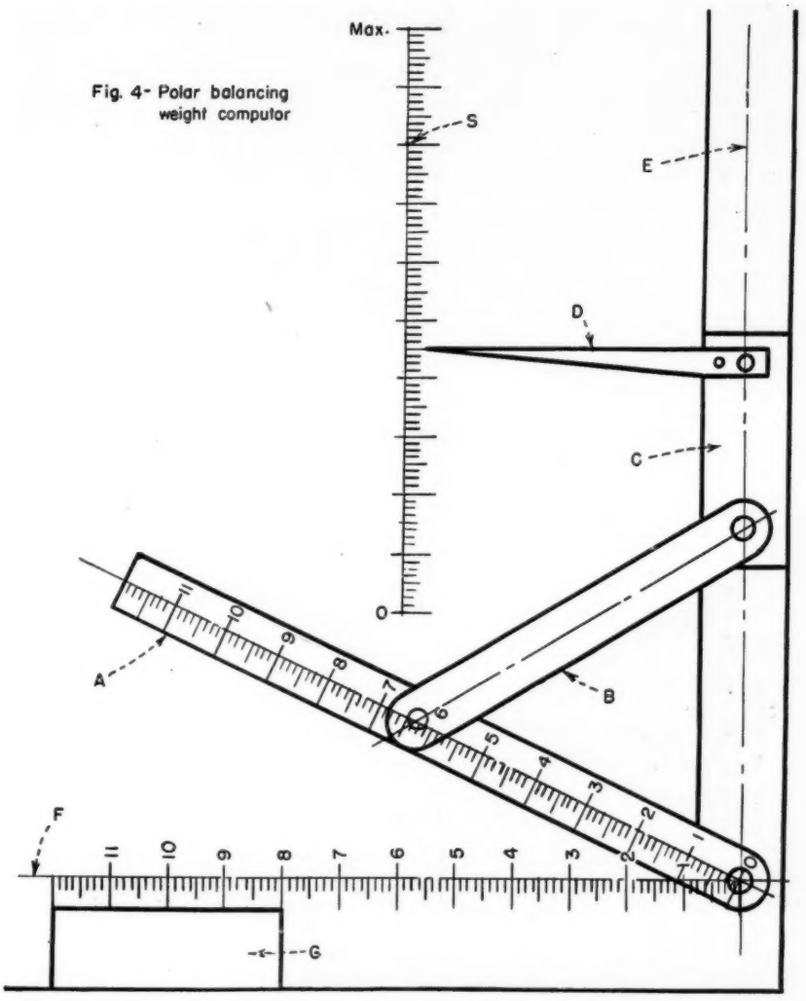
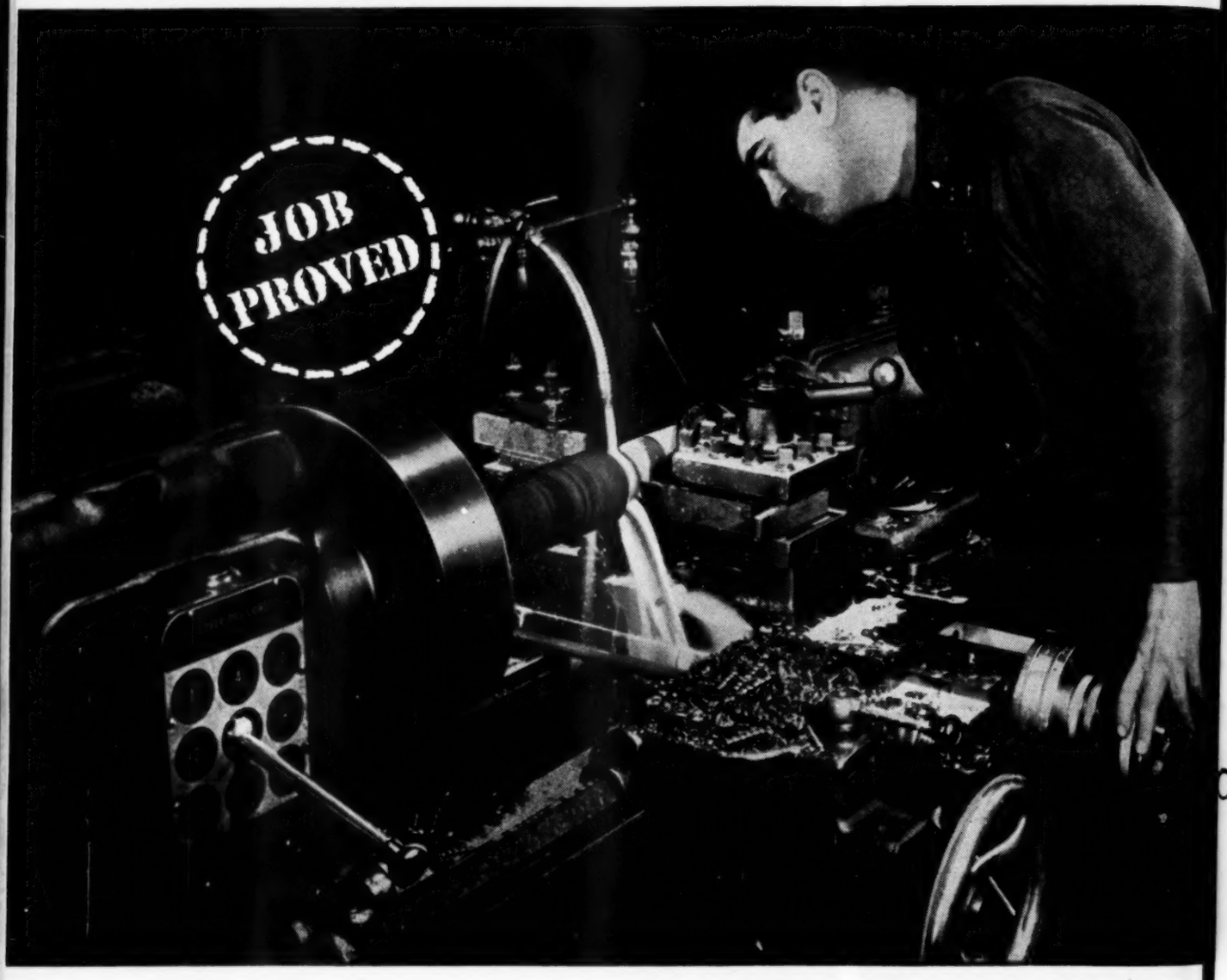


Fig. 4 - Polar balancing weight computor

3/8" Cut on S.A.E. 4640 Steel



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Machine — 20" x 96" "American" Pacemaker multi-production lathe
Operation — Turning 5" diameter shaft
Material — S.A.E. 4640 steel, heat-treated
Spindle Speed — 133 r.p.m.
Cutting Speed — 175 s.f.p.m.
Depth of Cut — 3/8"
Feed — .015"
Tool — Cemented carbide
Cutting Lubricant — One part Sunoco to 20 parts water

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USE OF POLAR BALANCING WEIGHT COMPUTOR

Fig. 5 - Setting of disk

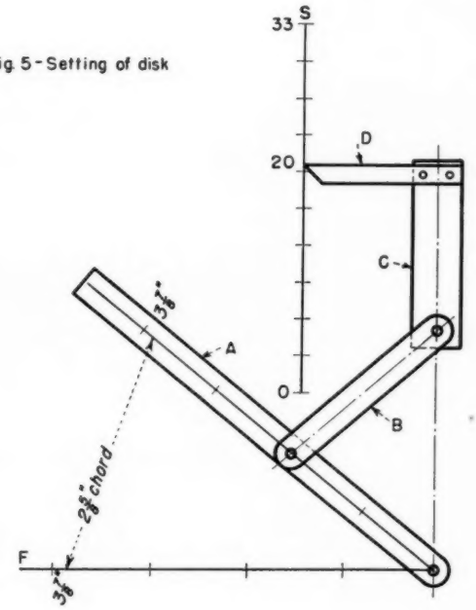
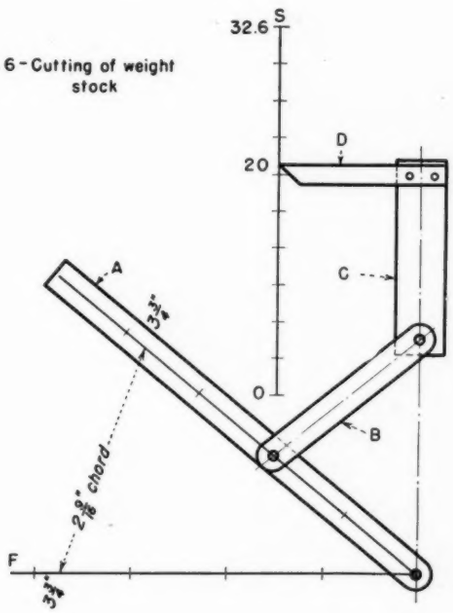


Fig. 6 - Cutting of weight stock



Calculators for Balancing Problems—III

S. A scale in inches is laid out on both base line *F* and arm *A* for the radius measurement. Stop *G* supports arm *A* while lying on baseline *F*.

With two disks set at 180° from each other, zero unbalance is obtained, and is represented on this instrument when arm *A* lies on the baseline *F*. When the two disks are set together (0°), maximum unbalance is produced and is represented when arm *A* lies on line *E* and pointer *D* is at the top of the scale. Scale *S* can now be laid out by dividing equally this maximum value of unbalance between zero and top of scale.

By setting pointer *D* to a reading on scale *S*, the angle between arm *A* and baseline *F* will be the angle the disks must be overlapped on each side of the angle of unbalance to obtain the exact force necessary to correct the unbalance. Chord measurements can then be taken at any convenient radius for setting the disks.

The instrument is also used to calculate the amount of weight cut from a circular piece of stock. At zero unbalance the centerline of arm *A* lies on line *F* and pointer *D* at zero of scale *S*. Again, the maximum unbalance is represented when arm *A* lies on line *E* and pointer *D* is at top of scale *S*. The value of this maximum unbalance is the force produced by one-half of a circle of the stock to be used. Maximum value can then be equally divided between zero and top of scale *S*. The scale may be laid out in ounces-inches or ounces, whichever reading is conveniently obtained, because the radius remains a fixed value. Then after setting pointer *D* to a reading on scale *S*, the angle between centerline of arm *A* and the baseline *F* will be the amount of weight stock to be placed on each side of the angle of unbalance.

Setting of Disk

The following problem demonstrates use of the computor. A pair of balance disks, 7¾ in. in dia. by ⅛ in. thick, weighing 11.8 oz. each, are to be set to offset an unbalance of 20 oz-in.

Scale *S* for this size disk, Fig. 5, is laid out to a maximum value of 33.0. This figure is used because the force for the two disks at 0° will be the radius to the center of gravity of the disk (in this case 1.4 in.) multiplied by the weight: $2 \times 1.4 \times 11.8 = 33.0$ oz-in.

To operate, set pointer *D* to the value 20 on scale *S*. Then, with a pair of dividers measure the chord at 3⅞-in. radius (outside edge of disk) between arm *A* and the baseline *F*. This will be 2⅝ in. at setting of 20. Then mark on the unit to be balanced the angle where weight is to be added and overlap each disk to produce a 2⅝-in. chord each side of the angle. The force will be exactly 20 oz-in.

Cutting of Weight Stock

Another problem requires cutting a piece of balance weight (to produce a force of 20 oz-in.) out of steel stock ¼ in. thick, 4¼ in. inside diameter and 7½ in. outside diameter.

Scale *S* for this size ring is laid out to a maximum value of 32.6, Fig. 6, because one-half of the ring weighs 17.4 oz. and the radius to the center of gravity is 1.875 in. Then, the maximum force will be: $17.4 \times 1.875 = 32.6$ oz-in.

To operate, set pointer *D* to the value 20 on scale *S*. Then with a pair of dividers measure the chord at 3¾ in. radius (outside edge of ring) between arm *A* and the baseline *F*. This chord will be 2 9/16 in. at setting of 20. The weight can then be cut to extent the length of this chord (2 9/16 in.) each side of the angle of unbalance.

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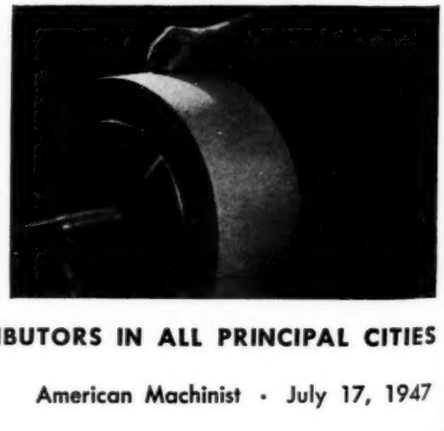

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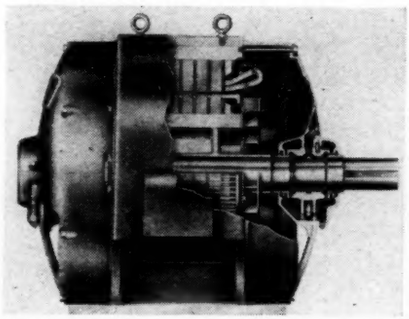
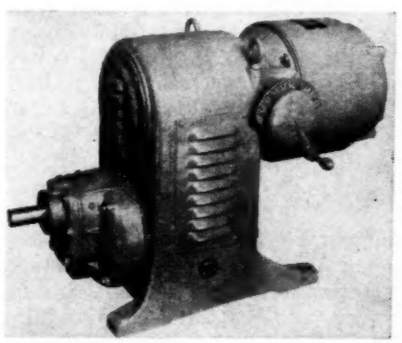
Parts and Materials



Heavy-Duty Induction Motors Made by Electric Machinery

Electric Machinery Mfg. Co., Minneapolis 13, Minn., has announced Heavy-Duty squirrel-cage induction motors for drives from 100 to 1000 hp. with 1800-rpm. speed or less. The units are designed to be drip- and splash-proof.

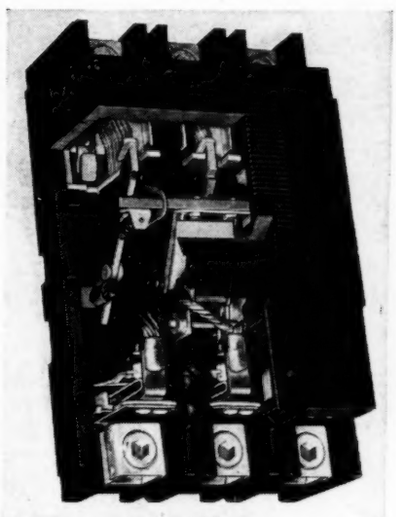
The fabricated steel frame is said to shut out falling particles and provide quiet operation and easy cleaning. Access plates on the larger ratings are removed for inspection and blowing out. Sealed bearings can be cleaned and refilled without motor disassembly. Double-end ventilation is provided by a blower on each rotor end. Across-the-line starting characteristics are NEMA Class B (normal torque, low current).



Size 23 U. S. Varidrive Motor Provides Variety of Assemblies

First of a new series of Varidrive motors, the Size 23, has been announced by U. S. Electrical Motors, Inc., Milford, Conn., or 200 E. Slauson Ave., Los Angeles 54, Calif. The series will provide smaller size for given hp., longer belt life, more convenient positioning of the speed-adjusting handwheel and easier change of Varibelts than on previous models.

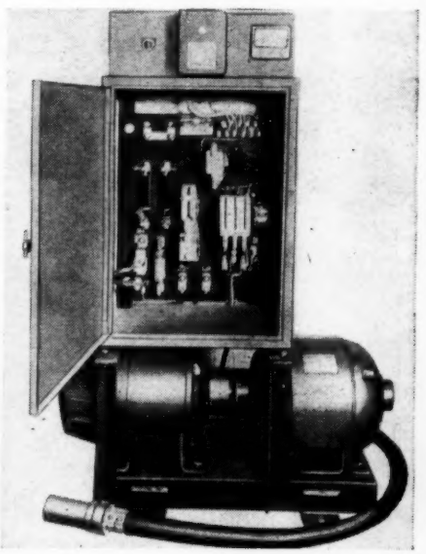
A variety of assemblies are available for the Size 23. They include: horizontal frame with shaft left or right, upright frame with shaft high or low, and built-in single- or double-reduction speed reducers. Speed variations of 2:1 to 7:1 are available with output up to 5 hp.



CIRCUIT BREAKER is 10⅜ in. high, 6 in. wide. Known as type ML-3, it has trip ratings from 125 to 225 amp. Voltages are: 125- to 250-v. dc., 250-v. ac.; 250-v. dc., 600 v. ac. Solderless connector facilitates insertion of heavy cable by swinging open lug. Made by Square D Co., Detroit 11, Mich.

GE Tungsten-Electrode Line For Atomic-Hydrogen Welding

A line of tungsten electrodes for atomic-hydrogen and inert-arc welding is available from Electric Welding Div., General Electric Co., Schenectady, N. Y. In diameters from 0.040 to ½ in. and lengths from 3 to 24 in., they can be used for manual or automatic welding. They are said to be free from non-metallic inclusions, cracks, slivers, seams. Lengths to 60 in. can be furnished.



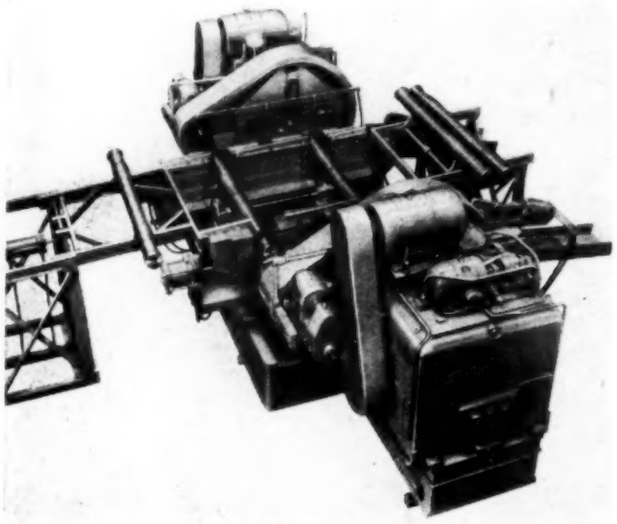
BATTERY CHARGER—Single-circuit battery-charging motor-generator set has control panel mounted above. Meets requirements of 18-cell, 550-amp. hr., lead-acid type storage battery. Connection of battery to terminals starts completely automatic cycle. Batteries charged at specified rates. Made by Motor Div., General Electric Co., Schenectady, N. Y.

Line of Market Forge Casters Made with Aluminum Wheels

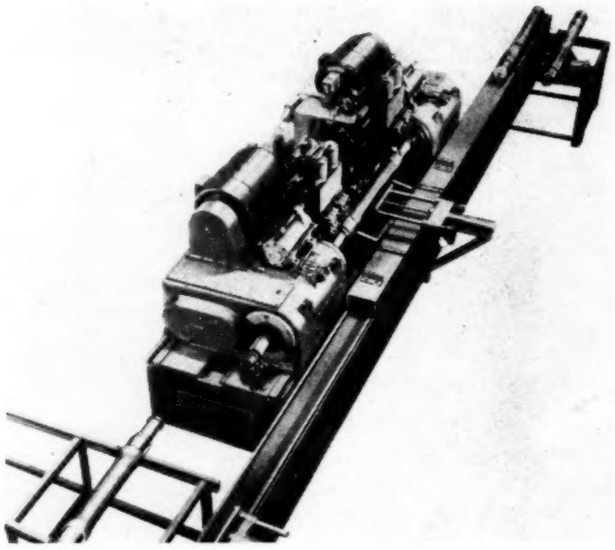
Aluminum-wheeled casters are now being manufactured by Market Forge Co., Everett 49, Mass. Available in swivel and rigid types, they are equipped with 4x2-, 6x2-, and 8x2-in. wheels.

The wheels are made of aluminum alloy with higher tensile strength than cast iron. They have non-sparking properties and are electrically conductive. Thus they are advantageous in plants where explosive hazards exist, because they will not spark when hitting other metallic objects and will not build up static charges. The wheels are said to provide more than 50% weight reduction when compared with semi-steel wheels. They also have the inherent "greasiness" of aluminum which serves to reduce wear on both the floors and wheels.

Shop Equipment News



1 ROUGH FORGING is held stationary as rotating tools remove scale, groove and shear off crop, center drill



2 ROUGH TURNING in second machine takes place as friction pads rotate the axle from both ends

Cross Transfer-matic Finishes Railroad Axles in 3 Steps

Machining railroad-car axles on a mass-production basis is possible with a series of new machine tools developed by The Cross Co., Detroit, Mich. Known as a Transfer-matic (Cross' trademark for automatic machines equipped with automatic, power work-transfer mechanisms), it is capable of producing from 15 to 20 of the more popular-size axles per hour at 80% efficiency.

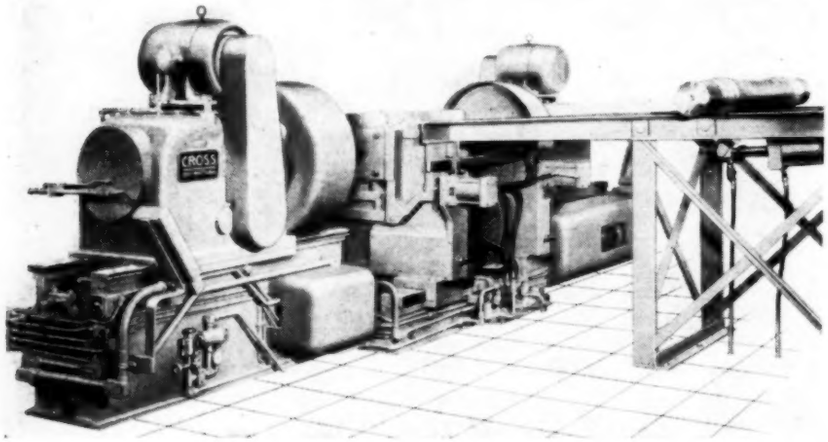
Two of the difficulties connected with machining railroad axles had to be overcome to permit high production. These are, first, removing the crop (surplus material forged on the ends of the axle which often reaches a length of 6 in.) and, second, putting an extremely smooth finish on the axle ends so they will not accumulate waste from the journal box.

The Transfer-matic consists of three machines with connecting conveyors. On the operation of the transfer device at the beginning of each cycle, a rough forging enters the first machine from a loading rack. At the same time a finished piece is ejected to a conveyor which carries it to the loading rack of the next machine.

Control is by pushbutton. Carbide tools are used throughout for maximum speeds and feeds. An example is the lathe, where 70 lb. of stock is removed in 2½ min. Hydraulic power positions the work, provides feed and rapid traverse, and is used for other functions.

Chips are disposed of automatically through a combination conveyor and centralized coolant system located beneath the floor. When ends are cropped, they drop into a separate container.

First machine is a two-station, double-end type which holds the



3 SMOOTH FACING of both ends with single-point rotating tools is done by third machine, with twice capacity of first two

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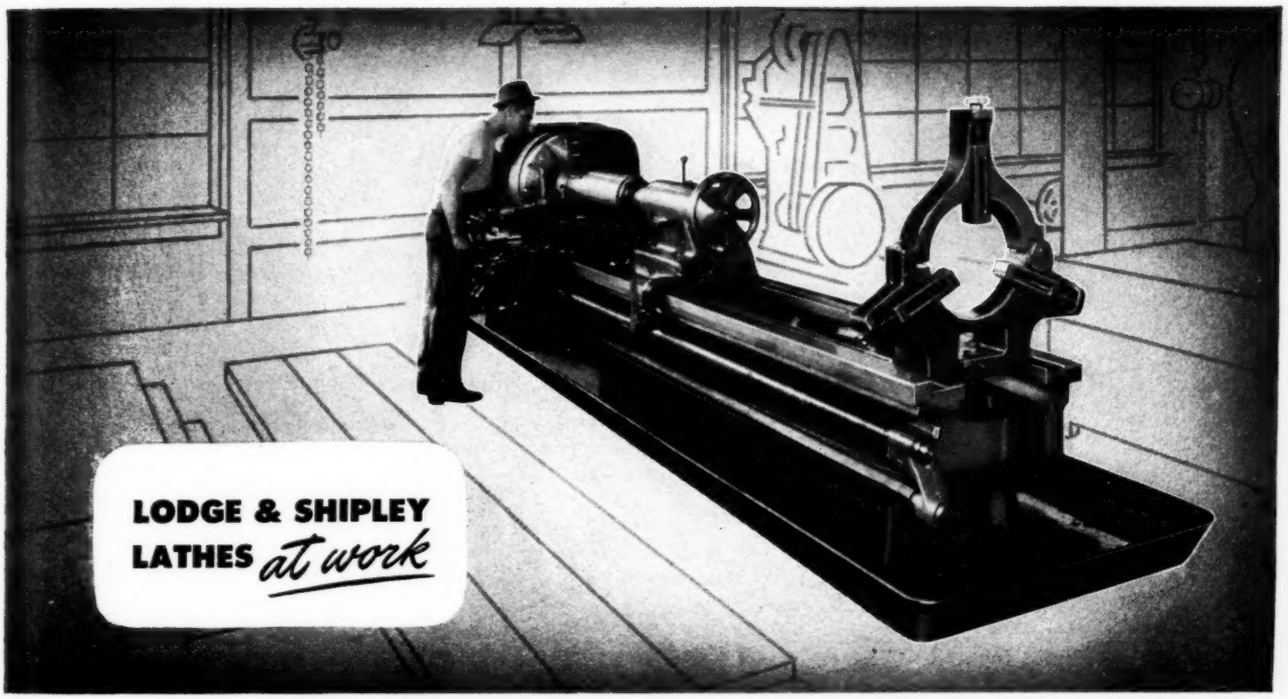
"HEAT TREATED STEELS"

"CARBON & ALLOY FORGINGS"

"STEEL CASTINGS"



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In the plant illustrated above, for example, widely varied production on all types of work proved the point. In addition, as the owner stated, "No other lathe will remove heat treated alloys faster".

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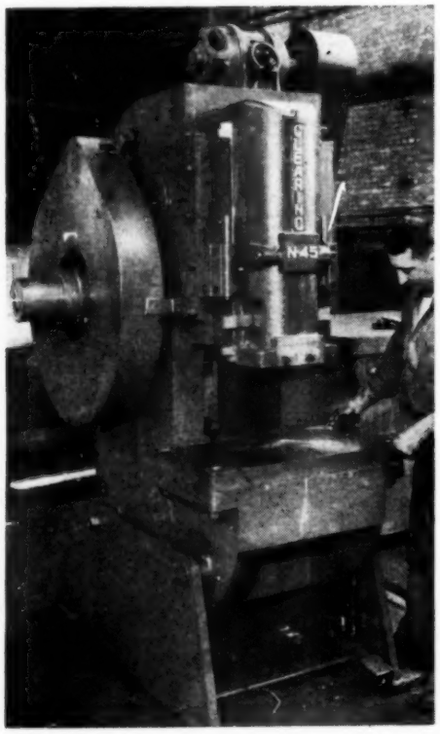
axle stationary while tools rotate. At No. 1 station a short, rigid tool in each head removes the scale. On the clean surface provided, two opposed parting tools cut a groove in the crop, leaving a neck of about ⅝ in. Automatic shears enter the grooves and remove the crop. At station No. 2 both ends are centered in conventional fashion.

Second machine supports the axle between centers, rotating it by friction pads. This machine is a single-station, double-end automatic lathe for rough turning the end collars, journal dust-guard diameters and wheel seats. Turning is by overhead tools, while tools at the rear face the shoulders and form the fillets.

Third machine puts a smooth face on both ends of the axle with a single-point carbide tool at each end. The part is held stationary by V-clamps while the rotating tools feed across the face of the work. Finished axle is ejected onto a conveyor where it is crated for shipment. This last machine has twice the capacity of the first two and can handle the output from two pairs of them if desired.

The Transfer-matic line of machines will handle forgings from 3¾ to 10½ in. in diameter and from 5 to 9 ft. long.

Clearing Non-Flex Gap-Type Press Operated by Rocker Arm, Eccentric



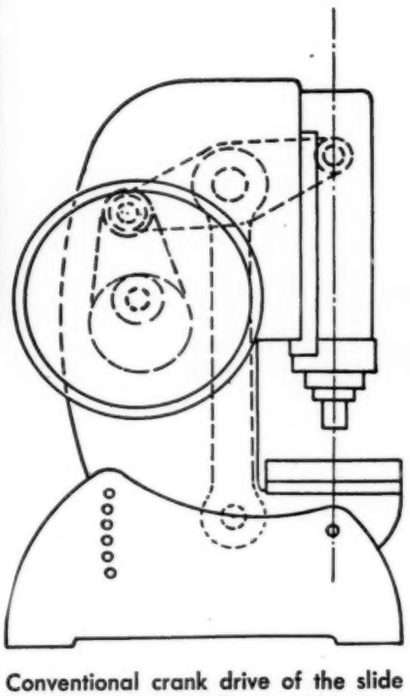
The design of the Non-Flex press places the point of loading close to the neutral axis to eliminate deflection of the C-frame

The first of a line of Non-Flex inclinable gap-type presses has been announced by Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill. Departing from conventional design, the press utilizes the overhanging portion of the C-frame for guiding the slide only. The point of loading has been transferred through a link to the reinforced lower part of the frame. This feature is said to eliminate deflection of the C-frame (springing or spreading of the gap) and thus keep punch and die aligned. Previous designs tended to deflect in an arc, throwing upper die or punch out of line with the mating portion of the lower die.

The unit has 45-ton capacity and 4-in. stroke. It is powered with a 5-hp. 900-rpm. electric motor. The flywheel model operates at 90 strokes per min., and the back-geared model can operate at 45 strokes per min. The bed is 18x30 in., while the bolster is 2½ in. thick. The Non-Flex line will later be extended to have a range from 25- to 100-ton capacity.

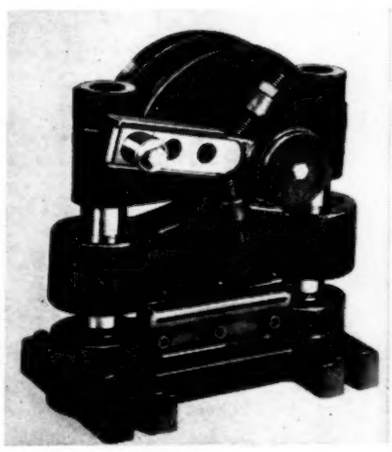
The slide guides are extra long, and gibs are equipped with graduated indicators for accurate adjustment of the slide. An air-friction clutch with non-repeat mechanical control is incorporated. The press is made with all-steel welded construction.

Accuracy obtained between punch and die through the non-flexing property of the C-frame and the length of slide guides is said to lower power requirements, eliminate burrs on the blank, provide uniformity of finished product, and to considerably lengthen die life.



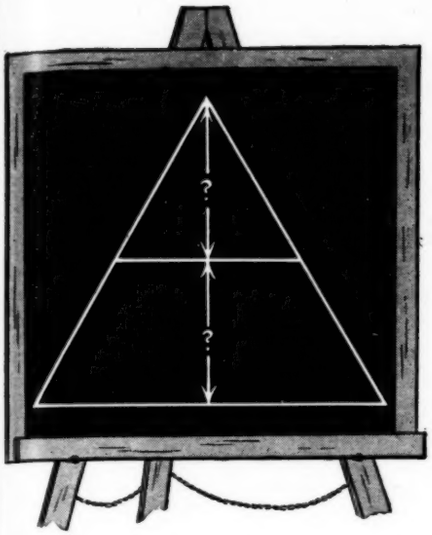
Conventional crank drive of the slide has been replaced by a rocker arm operated from an eccentric drive located in the back of the press. The rocker arm pivots in a link which is hinged and anchored close to the neutral axis in the lower part of the frame of the press

Haller Ram-Driven Scrap Cutter Mounts on Press Bolster Plate



A ram-driven scrap cutter for use on almost any punch press is made by Haller Machine & Mfg. Co., Inc., 7940 Tireman Ave., Detroit 4, Mich. Known as Model D-611, the unit measures 6½ in. wide, 9¼ in. deep and 10 in. high. It mounts on the bolster plate of the press and is driven directly by the ram or die. It is adjustable for any ram-stroke length up to 6 in. The high-speed steel blades can be removed to be sharpened or replaced.

Stock up to 4-in. width and 3/32-in. thickness can be cut on the unit.



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A SIZE IS WHAT IT SEEMS?

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What size is this Socket Screw? 2.

ANSWERS:
1. Top section is taller.
2. No question if it's Size-Marked!

● If you get the right answers to these questions, you're one of a select group. For "eye-gauging" fools many a shopman . . . even some of the experts. In a test that required judging the size and pitch of an ordinary socket screw, many failed. On the job, that means they must take *time out* to *find out.*

But there's no question with a P-K Socket Head Cap Screw. The SIZE-MARK clearly incised on the head, shows the size and pitch at a glance. No need to waste time gauging . . . or chance errors by guessing. This P-K "exclusive" will simplify and speed up identification . . . and assembly work. Ask the men in your shop.

Assembly line operators report valuable time saved because sizes are always issued correctly . . . *tool crib bosses* say sorting is made easier, speeded up . . . *new help* agree sizes can be learned faster . . . all because of the P-K Size-Mark. And *Sales Managers* recognize the Size-Mark as an added sales feature . . . a definite aid to customers' service men in reassembly.

Plus—GEAR GRIP*

Makes fast fingers, sure fingers . . . makes them slip-proof even when oily. Only P-K offers both Size-Mark and Gear Grip in Socket Head Cap Screws.

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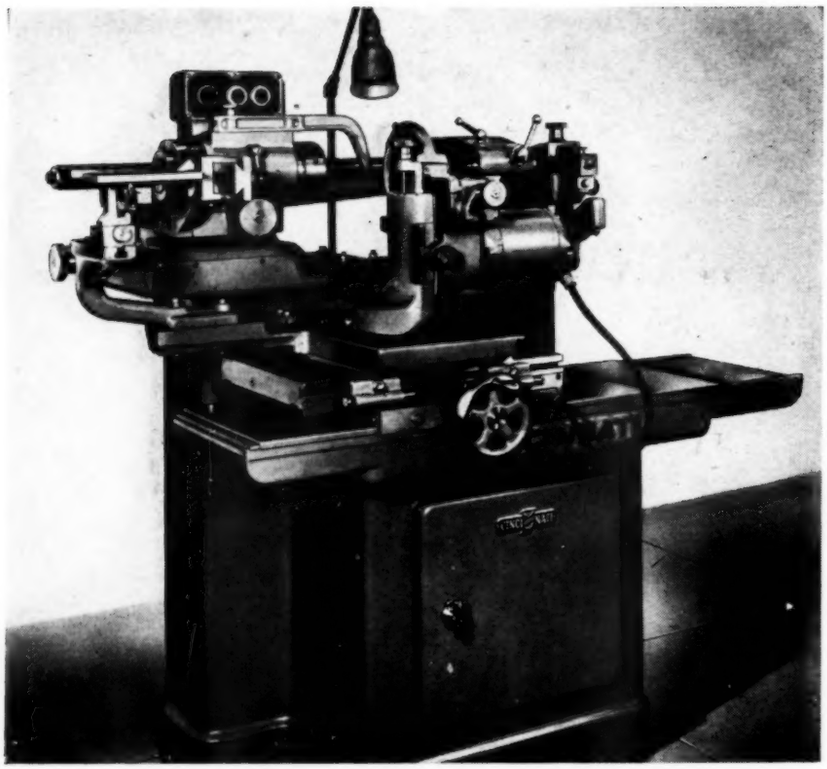


Cutter-teeth contours are generated on this machine by duplicating a sheet-metal master templet of desired shape

Cincinnati Milling Machine Unit Sharpens Contour-Ground Cutters

A machine for sharpening contour-ground form-milling cutters has been developed by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Cutters are sharpened by grinding on the periphery rather than on the flat rake face of the tooth as is done with conventional form-relieved cutters.

Teeth are ground by duplicating a master templet. The tracing is hand controlled and is said to require little effort because the wheelhead unit is on an anti-friction mounting which provides "free" longitudinal, transverse and swivel movements. Wear on the templet is negligible, and convex or concave radii, angular faces and combinations of these elements can be accurately produced. The templet holder has adjusting screws to simplify alignment of templet and cutter when setting up.

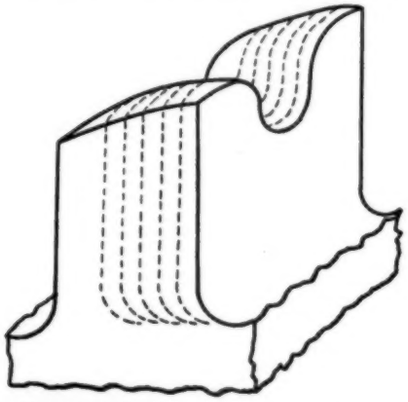
The wheelhead base carries a follower pin which is held in contact with the templet as the tooth is being ground. The pin is located on the axis of rotation of the wheelhead swivel base. The grinding wheel is trued to a matching radius above and is in line with the contacting surface of the pin.

The wheelhead has a vertical positioning slide for grinding clearance or "back-off" angles. A transverse position slide compensates for wheel wear. The entire wheelhead unit is shifted into truing position by handwheel.

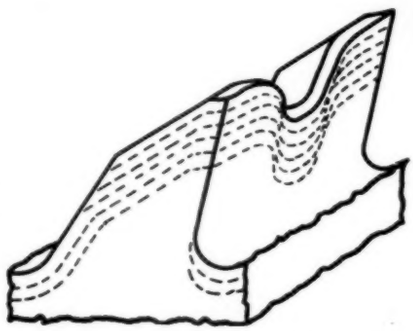
The workhead is mounted on transverse and longitudinal slides with micrometer adjustment for accurate positioning of cutter in relation to templet. Cutters to be sharpened are generally mounted on arbors. The spindle nose is a quick-change type to facilitate mounting. The cutter tooth is located in grinding position by means of a centering gage on the workhead.

Leads are generated by tracing from a master cam on the left-hand end of the workhead spindle. Six cams are supplied. A second angularly adjustable flat cam provides compensation for rake angle. It is interconnected with the lead cam by means of a pivoted rocker arm.

The machine is mounted on a box-section base with built-in compartments for tools and electrical controls. A dust-collector prevents dust from accumulating on templet.



FORM-RELIEVED tooth becomes narrow and weaker when sharpened. Desired profile must be carried back into the tooth



CONTOUR-GROUND tooth retains original shape and strength with repeated sharpenings. The desired profile occurs only at the cutting edge, and proper clearance angles can be easily maintained

Size Control Plain Plug Gages Made of Norbide, Are Reversible

Reversible plain plug gages manufactured by Size Control Co., Div. American Gage Machine Co., 2500 Washington Blvd., Chicago 12, Ill., are now made of Norbide. Said to have 200 times the life of former taper-lock steel gages, the gages can be quickly reversed in a positive-locking pin-vise aluminum handle. "Go" end is finished in green and "no-go" end is in red. Plugs are extra-long, and tips may be cut when they become worn.

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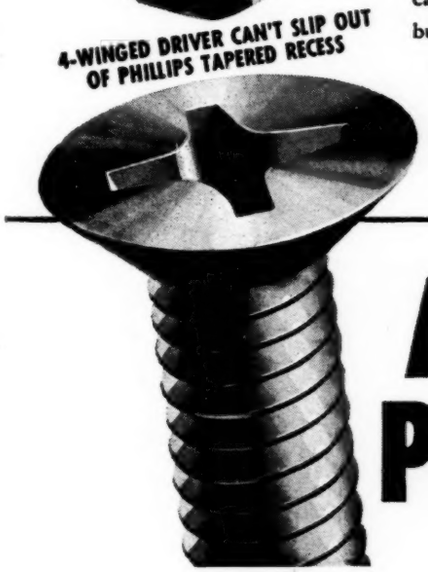
through High Style — Peak Performance — *Stratospheric Production Savings!

In Production: American Phillips Screws give you "air age" fastening — fast, fumble-proof, slip-proof, reject-proof. Both the work and worker are out of harm's way — driving is automatically straight. When these engineered screws "button up" your products, *time-savings soar *as high as 50%* — volume booms and your net looks nicer!

In Promotion: The decorative, straight-set, unburred head of the American Phillips Screw can't catch clothes or hose — but it *does* catch the eye! Customers know, too, that they're buying top serviceability — they can see it! And long life — they expect it! Join the many makers of appliances, cars, radios and other products who are cashing in on the *double advantages* (Production and Promotion), provided by American Phillips Screws.



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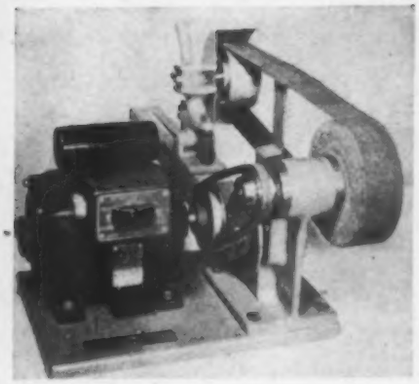
Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



Porter-Cable Utility Grinder Incorporates Abrasive Belt

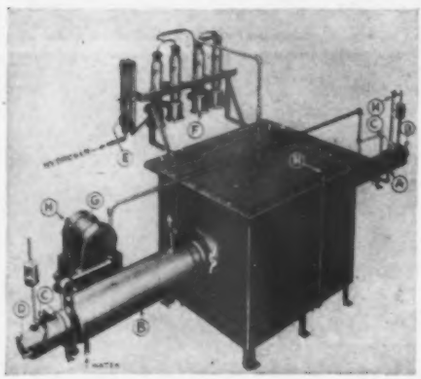
An abrasive belt has been applied to a utility grinder manufactured by Porter-Cable Machine Co., Syracuse 8, N. Y. The belt operates over a resilient contact roll which is said to eliminate chatter. Wear is on the abrasive belt, and thus the roll maintains its diameter and balance and remains square at the sides. The grinder is adjustable 90° and is shown in horizontal position.

Grinding can be done on the roll and then squared up on the platen just above the roll. Inside grinding can be done and held flat by working over the side of the platen. An additional resilient contact roll can be provided in place of the platen for grinding rounded or oval parts such as scissor handles. Work can also be done on the free grinding belt.

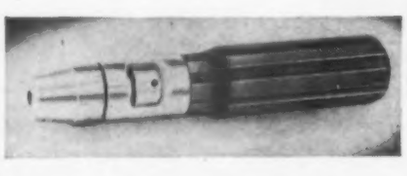
Selas Automatic Gas-Fired Unit Heat-Treats Fragile Assemblies

An automatic gas-fired machine for heat-treating fragile lightweight assemblies has been developed by Selas Corp. of America, Philadelphia 34, Pa. In the illustrated application magnetic pull wires for business machines are handled at the rate of 1200 pieces per hr.

The pull-wire assemblies consist of two eyelets welded to a connecting steel wire. Assemblies are placed on a rotating drum and first pass under a set of burners which bring the eyelets to hardening temperature. They are quenched in this position by water spray on the side of the burner. A second set of burners anneals the weldments and applies water to the eyelets at the same time so they will not also anneal. Eyelets are hardened for wear resistance, and weldments are annealed to prevent breakage.



ELECTRIC FURNACE—Unit degasifies and anneals rare metals in hydrogen atmosphere, can take temperatures to 3000 F. Made by Eisler Engineering Co., Inc., 740-770 S. 13th St., Newark 3, N. J. A-loading chamber, B—Water-cooled unloading chamber, C—weighted safety doors, D—glass peepholes, E—hydrogen-flow gage, F—drying towers, G—auto transformer, H—test pipe with cock



Trutorq Model CSD-15 Screwdriver Sets Torque on Calibrated Head

The Model CSD-15 Trutorq screwdriver is available from Airdraulics Engineering, Inc., New Canaan, Conn. Similar in operation to the other Trutorq tools, it operates on the friction-disk principle. Accuracy is said to be within a fraction of an inch-pound after as many as 300,000 continuous operations.

The calibrated head permits the operator to set desired torque from 1 to 15 in.-lb. without the use of other calibrating devices. There are no springs, pointers or dials to read on the unit. The handle has max. ⅞-in. dia. The body is of cast aluminum, the head is steel, and length with blade is 6¼ in.

For extremely precise work the punch is positioned with the aid of a magnifying glass

In Vinco Automatic Center Punch Shock Absorber Will Reduce Blow

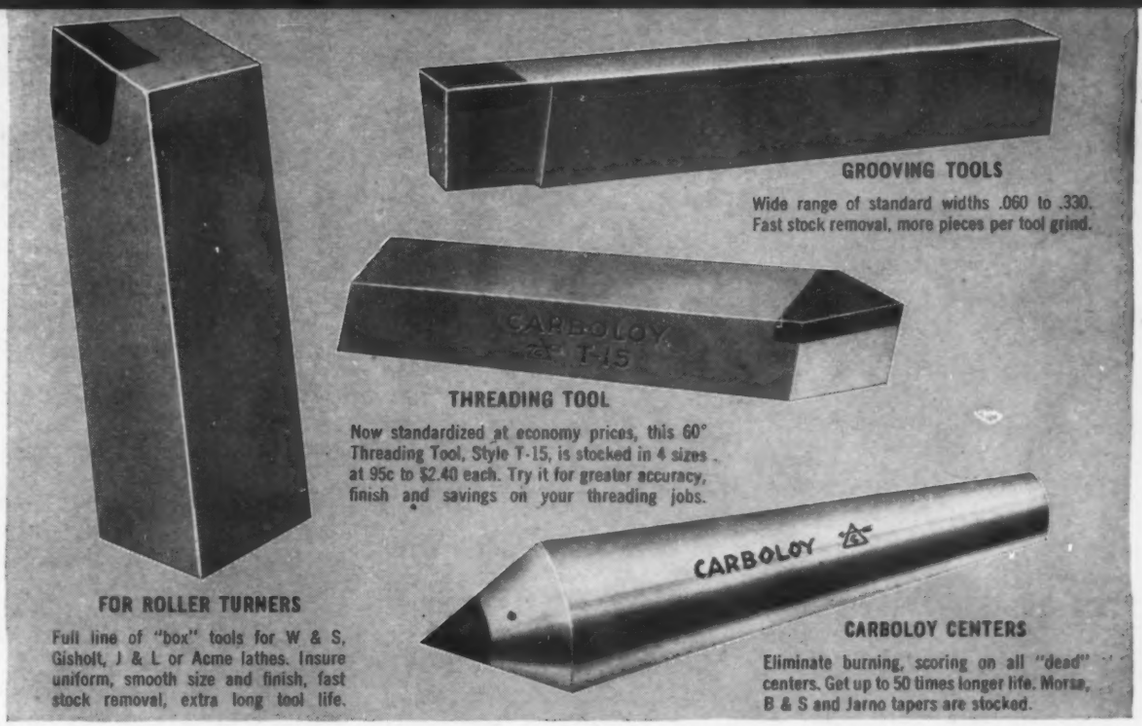
An improved automatic center punch in which the force of impact can be adjusted from 8 to 20 lb. is announced by Vinco Products, 326 Bond St., Asbury Park, N. J. When hand pressure is exerted an internal hammer is actuated which strikes the point to produce the impression.

At the low end of the adjustment a shock absorber reduces the punch mark so that greater accuracy may be obtained and so it will not distort light objects. Typically, the size of the impression can be varied from 0.008 to 0.031 in. in diameter.

Operating mechanism is housed inside a plastic handle. The punch (4 in. long) can readily be used with one hand. Points are replaceable. In addition to the standard point, carbide-tipped points are available for marking hardened steel.

A chisel point can be used for hand tooling soft metals or for delicate chipping operations. Other accessories include: a rivet point for delicate riveting or peening work; and points for cutting 0.090 and 0.045 in. holes in paper or leather; and a self-centering attachment for accurate mounting of hinges and brackets regardless of size. A small box is available to hold a punch and accessories. The punch is also made in a non-adjustable model.

4 LOW COST STANDARDS FOR SPECIAL PURPOSES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THREADING TOOL
Now standardized at economy prices, this 60° Threading Tool, Style T-15, is stocked in 4 sizes at 95c to $2.40 each. Try it for greater accuracy, finish and savings on your threading jobs.
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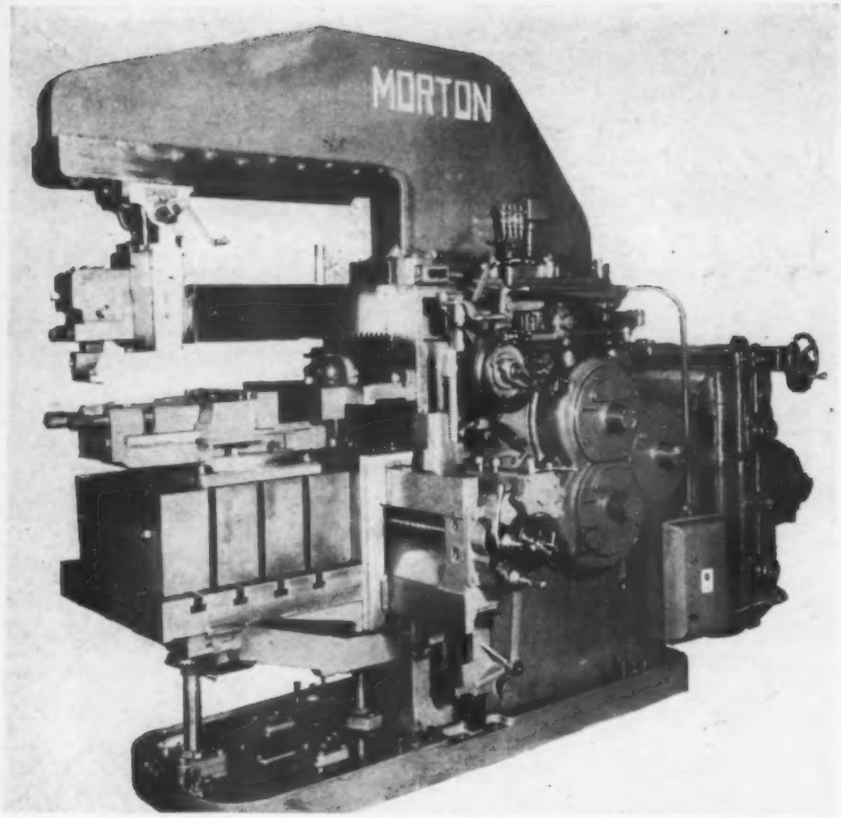


Design of this draw-cut shaper permits the table to be moved vertically without loosening and tightening outer support bolts

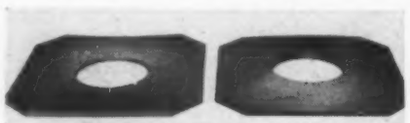
Morton High-Duty Draw-Cut Shaper Gives 32-in. Stroke Toward Column

A 32-in. stroke high-duty draw-cut shaper has been announced by Morton Mfg. Co., Muskegon Heights, Mich. With overhead ram support and a special heavy-duty shaper head, it is designed for light- and heavy-duty shaping and planing. It can perform jobs in railroad shops such as machining crown brasses, shoes and wedges and miscellaneous parts.

Two elevating screws provide alignment of work and table. The machine incorporates rapid power traverse and automatic feeds for horizontal and vertical movements. Distance from ram to lowered table is 30 in. There are 30 in. of horizontal or side feed and 16 in. of vertical feed.

The ram support and shaper head have special gibbing to permit quick adjustment. The unit is powered with either an ac. or a dc. 7½-hp. multi-speed motor. A 10-hp. constant-speed motor with control by variable-speed transmission can also be used.

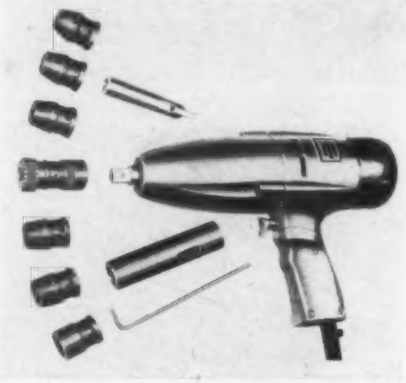
Chips move away from the operator toward the column on this machine. The design also provides a clear view of the work when shaping to layout lines. Deep cuts and coarse feeds are said to be possible, while all major moving parts are served by automatic oiling.



Di-Ali-Ners for Punch Presses Compensate for Misalignment

Di-Ali-Ners have been developed by Lempco Products, Inc., Bedford, Ohio, to compensate for misalignment of punch-press equipment. They consist of a pair of semi-elliptical plates, one concave and the other convex. Both have flat exterior surfaces. The hole in each plate is designed to be large enough to clear any die-set shank.

The plates are installed with curved surfaces facing each other. They are said to correct bad errors of alignment whether the fault lies between press bolster and die holder or between press ram and punch holder (either front to back or right to left). Made of cadmium-plated special malleable iron, they are said to require minimum setup time.



Ingersoll-Rand Electric Tool Gives 1900 Impacts per Min.

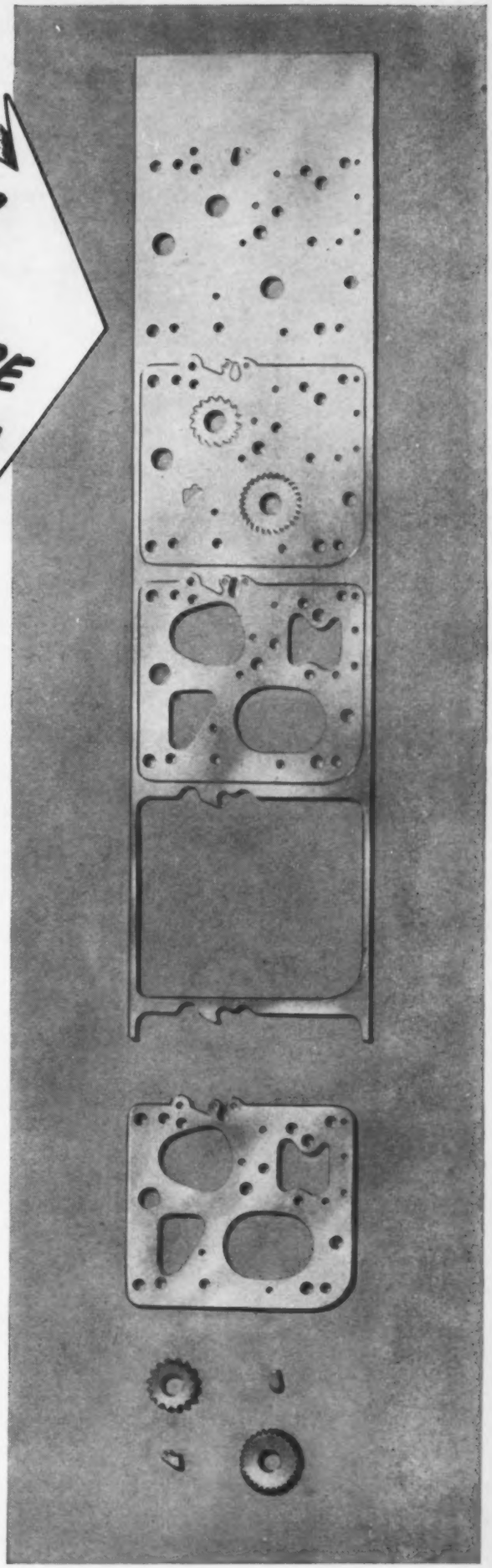
The Size 4U all-purpose electric impact tool has been announced by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. With standard attachments, it can perform jobs such as reaming, tapping, drilling and hole sawing. It can apply (or drive) and remove screws, studs and bolts. It also can do hole-saw work and remove broken capscrews.

The unit weighs 6½ lb. and has an over-all length of 10½ in. It has a free speed of 2000 rpm. and gives 1900 rotary impacts per min. under load. A specially designed, 3-amp., reversible, universal electric motor provides power and operates on 110 v., ac. or dc.

The tool runs like any conventional electric tool until resistance to spindle rotation reaches a certain amount. A mechanism then converts motor power into "rotary impacts" which are said to provide a powerful turning effect. The impact mechanism permits the spindle to be completely stalled while the motor continues to run. Thus motor burnouts from overloading can be eliminated.

The tool is rated to handle nuts and capscrews to ⅜-in. thread size. Other ratings are: ¼ in. drilling in metal (up to ½ in. by step drilling); reaming to ½ in. dia.; tapping from ¼ to ½ in. The impact mechanism is said to eliminate torque reaction to the operator. Thus it prevents kick and twist.

CLEVER PLANNING REDUCES SCRAP— SPEEDS MANUFACTURE



THIS photograph shows progressive steps in the manufacture of a clock frame, and is an excellent example of careful planning to reduce the amount of scrap and lessen the number of operations. Note that in only a few strokes of the machine not only is a plate punched for the frame, but also a gear, a ratchet wheel, and two other small parts are produced. The work is done on a dieing machine, which operates to the very close limits that are essential in a clock. An additional item of economy is the fact that most of the other parts are made from exactly the same kind and gauge of metal, greatly simplifying purchasing, stockroom management, and production ordering.

Planning such as this is more important than ever today, when metal is scarce, and it is essential to conserve it, as well as lessen costs and speed production.

The metal used is Revere Leaded Brass, supplied to exceptionally close limits as to composition, gauge, temper, flatness, and straightness. Revere takes pride in its ability to meet these strict requirements, and will be glad to collaborate with any manufacturer in working out the application of its metals to modern, simple, accurate, metal-and-money-saving plans and processes.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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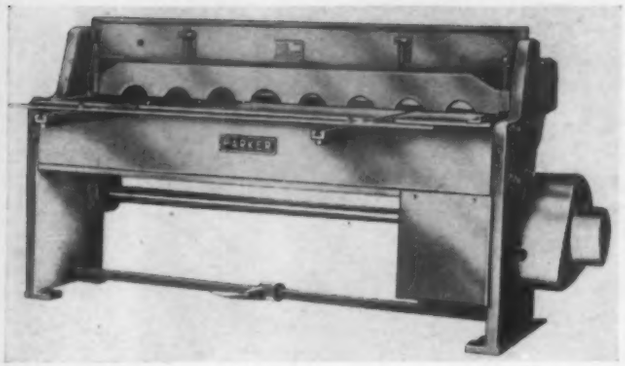
Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

Progressive steps in the accurate, economical manufacture of clock parts by the William L. Gilbert Clock Co., Winsted, Connecticut.



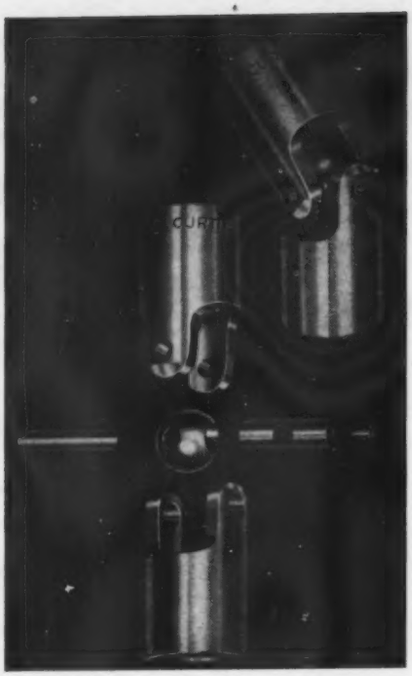
Drawn or folded parts can be cut to within 1½ in. of their shoulder on this shear. Thus a close trim can be made on parts such as basins, sinks and cowlings

Parker 10-Gage Squaring Shear Provides 85 Strokes per Min.

A 10-gage power squaring shear is announced by Parker Mfg. Co., 2200 Colorado Ave., Santa Monica, Calif. The shear is built from extra-heavy all-steel welded plate. Bed, ram, hold-down and working parts are reinforced. Breaking point of the steel is said to be three times that of cast iron, providing strength equal to that of larger and heavier units.

The unit is powered by 5-hp. motor and gives 85 strokes per min. Center of gravity is low for minimum vibration. Height is 47 in. and floor space is 32x104 in.

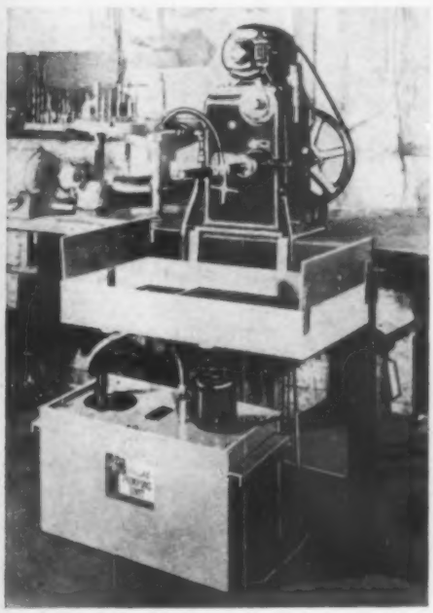
Four-edged tool-steel blades are standard equipment on the shear. Cutting length is 73 in., blade length is 75 in. Back-gage range is 18 in. and front gage range is 38 in.



Ball-Type Universal Joint Made in Two Sizes by Curtis

A ball-type universal joint made by Curtis Universal Joint Co., Inc., Dept. D., Birnie Ave., Springfield 7, Mass., is said to eliminate sliding friction and minimize bearing friction. It is designed to make the use of boots, covers and excessive lubrication unnecessary. Available in two sizes, ½- and ¾-in. dia., it will be made in larger sizes later.

The steel forks bear on a bronze ball with centerless-ground pivot bearing pins.



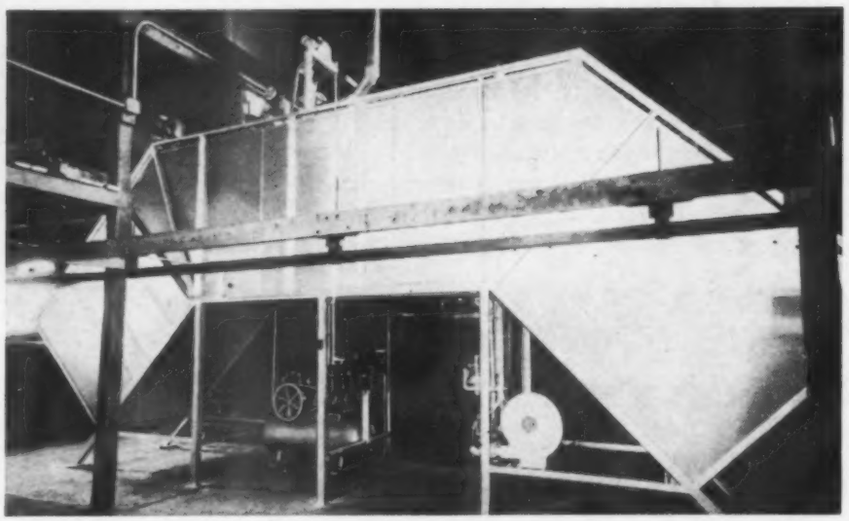
Gray-Mills Wet-Cutting Unit Attaches to Sunnen Grinders

Gray-Mills Corp., Evanston, Ill., has announced a wet-cutting conversion unit for use on Sunnen bushing grinders. The system can be attached to the grinder in 20 min. without cutting or drilling.

A fractional-hp. centrifugal pump, which is said to be unaffected by abrasives, is mounted in a 12-gal. baffle-equipped coolant tank. It pumps oil to the work through neoprene lines. A flexible metal nozzle with control valve and attaching bracket directs flow onto the work.

Oil returns to a pan which slides beneath the mandrel. Most of the abrasives are separated by a baffle plate, and the oil then flows back to the pumping unit for recirculation.

The unit is said to provide faster honing and more accurate finish.



INFRA-RED PROCESS—Gas-fired infra-red burn-off and rustproofing installation developed by Burdett Mfg. Co., 3433 W. Madison St., Chicago, Ill. Entire process is said to take approximately 5 min. on the average. With burners in proper relation to work, grease is removed and rust-resistant blue surface is formed simultaneously on metal

This NEW Veelos Catalog is Crammed with V-Belt Benefits for You

Here are just a few...

Insurance Against Shutdowns
Belt replacements for any length drive are always available from a reel of Veelos.

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Four reels of Veelos replace up to 316 sizes of endless V-Belts. Veelos takes up only trifling storage space . . . simplifies stock records.

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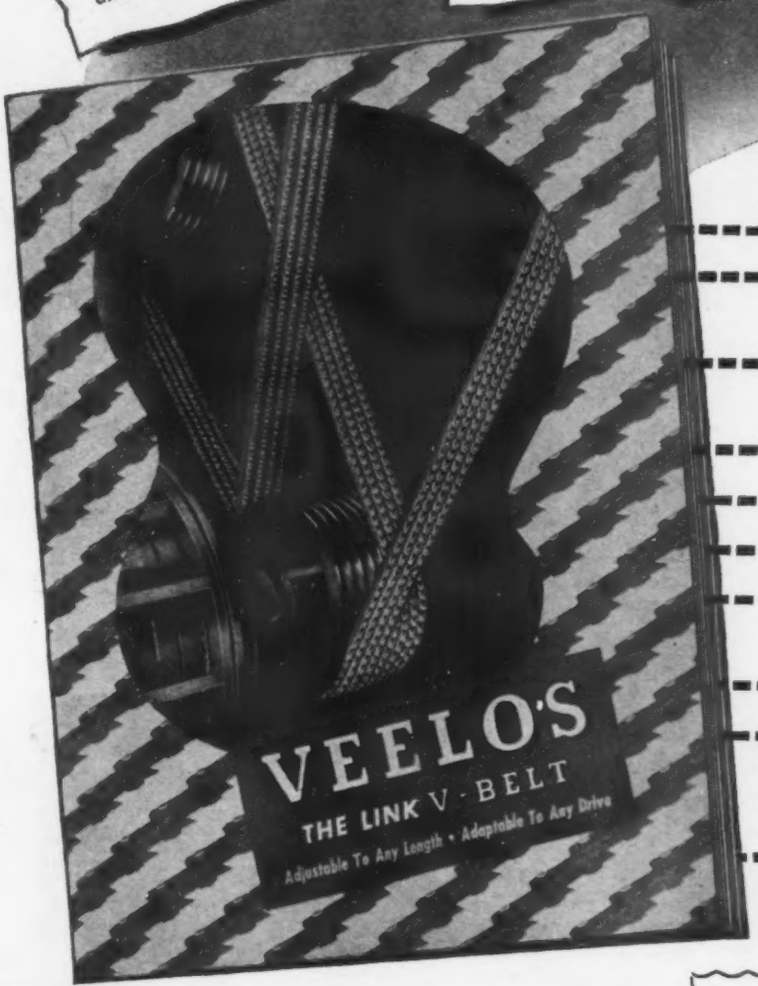
Belts are quickly uncoupled, made endless and installed. Installation savings run as high as 9/10 the cost of installing endless belts.

Easy Adjustability
Uniform tension maintained just by removing one or more links. On fixed center drives, slide rails and pivoted motor bases are not needed.



- 14 Important Advantages *(Page 2)*
- Four Reels replace up to 316 Sizes of Endless V-Belts (*Page 3*)
- Two Types Cover All Drive Requirements (*Page 5*)
- Special Applications (*Page 5*)
- Construction (*Page 6*)
- How to Measure (*Pages 7 and 9*)
- How to Couple and Uncouple (*Page 8*)
- How to Install (*Page 9*)
- Engineering Data: Selection and Length Tables, HP Ratings, etc. (*Pages 10 and 11*)
- Installation Photos of Veelos at Work in a Wide Variety of Industries (*Pages 12 to 24*)

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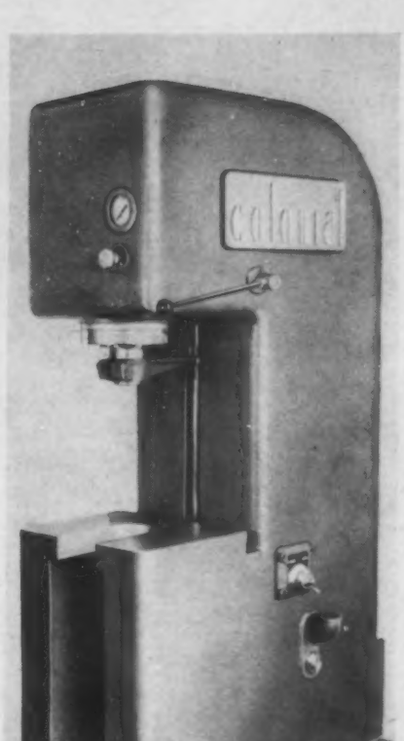
Veelos—Known as VEELINK outside the United States

ROLL SELECTOR—Automatic hopper-fed unit checks length and two end diameters of small parts such as roller bearings, dowel pins. Parts feed by gravity, are checked by three gaging heads and segregated into four classifications at rate of 3600 per hr. Made by Sheffield Corp., Dayton 1, Ohio



Colonial Broach 10-Ton Press Adjusts Pressure through Dial

A 10-ton model has been added to the Series PA line of standard hydraulically operated assembly presses made by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. The line now has five basic models with a range from 10 to 50 ton.

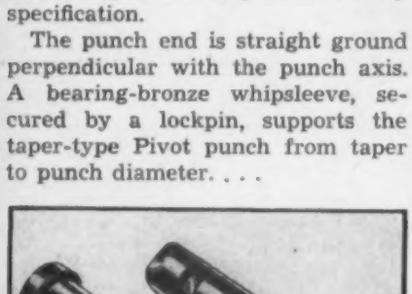
The new unit has a 12-in. adjustable stroke. Power-stroke speed is 180 ipm., while return speed is 360 ipm. Ram speeds are adjustable over a wide range. Working pressure is adjusted through the knurled dial on the front of the machine to any amount below 1200 psi., and desired pressure can be selected through a direct-reading pressure gage adjacent to the dial. The machine is operated by a 7½-hp. motor and occupies 25x42-in. floor space.

Amount of daylight opening in the line is optional. The design permits it to be varied in 6-in. steps, while table height is increased or decreased so that ram position and over-all height remain the same. The unit is hand-operated, but may be supplied with pedal as extra equipment.

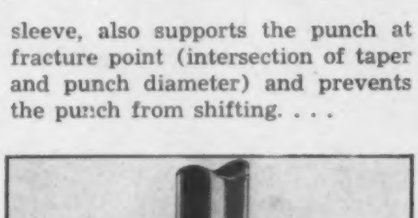
Straight-Ground Pivot Punches Use Whipsleeves for Accuracy

Pivot punches, which are said to punch any material thickness up to the compressive strength of the tool steel of the punch itself, have been developed by Pivot Punch and Die Co., North Tonawanda, N. Y. They are designed so that punch diameter can be one-half material thickness and yet retain accuracy. They are available as ¼-turn removable-shoulder punches or punches of any specification.

The punch end is straight ground perpendicular with the punch axis. A bearing-bronze whipsleeve, secured by a lockpin, supports the taper-type Pivot punch from taper to punch diameter. . . .



The whipsleeve is guided in a stripper with double line bearing. The stripper, by supporting the whipsleeve, also supports the punch at fracture point (intersection of taper and punch diameter) and prevents the punch from shifting. . . .



Bridge locks are used instead of wedges for punch removal. The punch is pivoted ¼ turn and removed. The strippers have removable base plates to aid punch removal. The close strippage used is said to eliminate dimpling.

Wales "CJ" Hole-Punching Units Punch Angles, Channels, Sheets

Heavy-duty Wales Type "CJ" hole-punching units designed to punch mild steel to ¼ in. thick are made by Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y. Each unit consists of a holder that carries punch, die and stripping mechanism. The design eliminates the necessity to attach punch to press ram and is said to provide permanent alignment of punch and die. The units have a pedestal die to permit punching angles and channels as well as sheets.

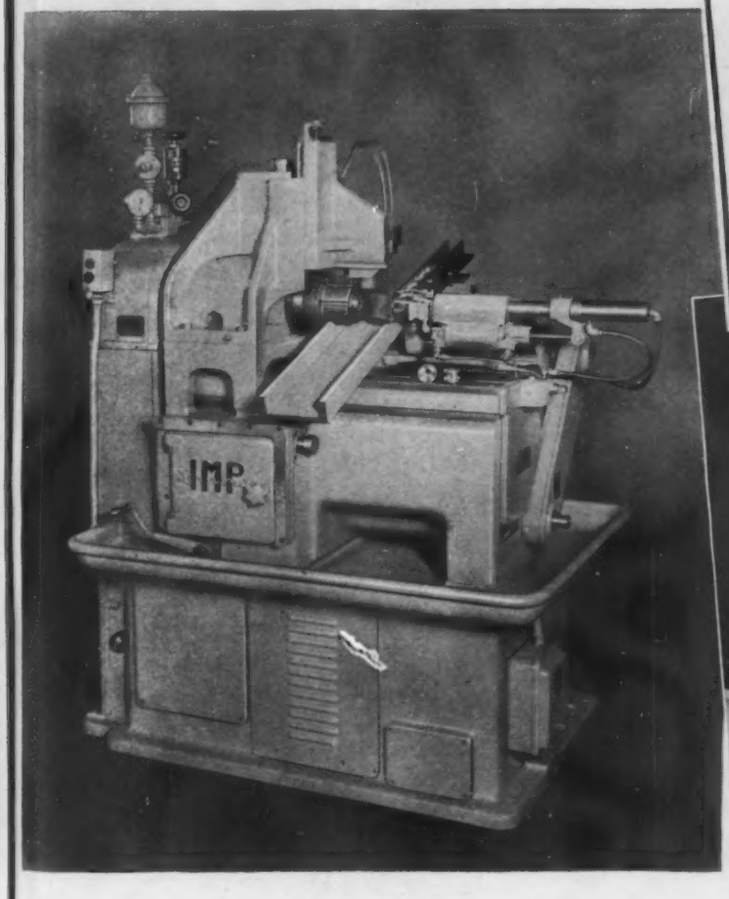
Setups are made on T-slotted plates or templets for press brakes

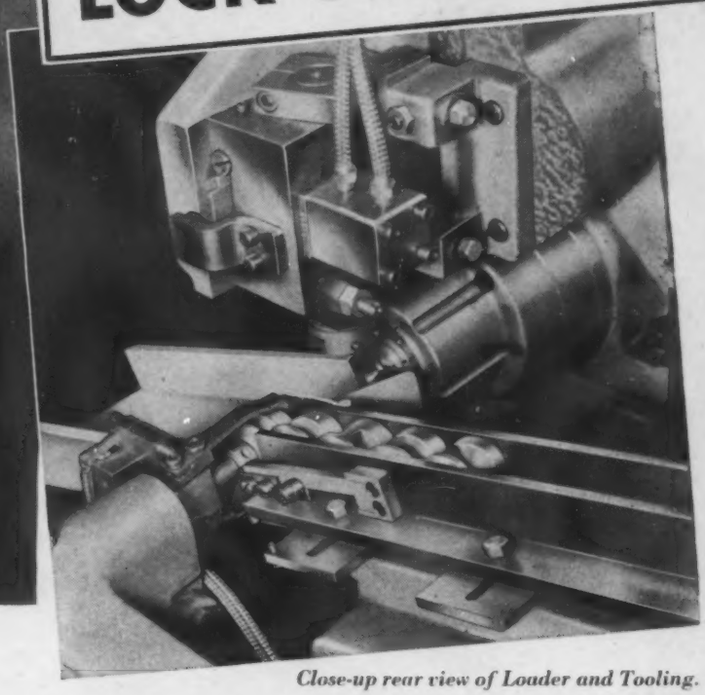
and stamping presses. The setup is then placed in the press and is ready to start punching. Shut height is the same on all "CJ" units, and thus the press ram needs only one adjustment regardless of how many hole-punching patterns are placed in operation. The units are available in three holder widths with a maximum punch dia. of ⅞ in.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Automatically-loaded Lo-swing IMP Slashes Costs on LOCK CYLINDERS





Close-up rear view of Loader and Tooling.

Problem: To reduce manufacturing costs on lock cylinders through the use of Automatic Work Loaders and fast cycle Automatic Lathes. In addition to automatic loading and ejection of the work, machining operations include facing and chamfering the front face of the cylinder.

Solution: Lo-Swing IMP Automatic Lathes, equipped with Seneca Falls Automatic Loaders, were selected for this job. This equipment provided a very fast, completely automatic cycle, entirely eliminating hand loading and assuring a constant flow of machined parts at exceptionally low cost per piece.

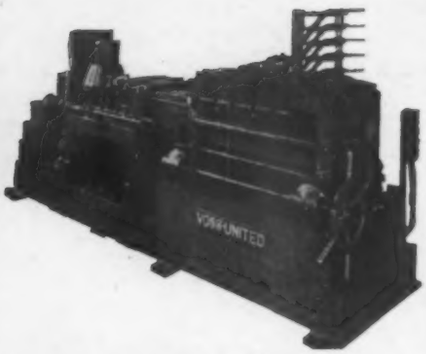
The partially machined lock cylinders are placed in the loader chute and fed by gravity to the loader injector arm which places the part in the air-operated collet chuck. This chuck revolves constantly, even during the loading part of the cycle. The facing and chamfering operation is then accomplished by two tools mounted on the vertical slide, which relieve on the return stroke to prevent scoring of the finished surface. The piece is then automatically ejected and the cycle repeated. Production is 625 pieces per hour per machine!

Lo-Swing Lathes fitted with Automatic Loaders are usually grouped together in series of two or more, as one operator can easily keep the loading chute on several machines filled with pieces. Seneca Falls engineers are always at your disposal to help find cost cutting solutions for your turning problems.

1947 MACHINE TOOL SHOW CHICAGO SEPT 17-26

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



Voss Inverted-Type Leveler Rolls Thin-Gage Sheet Metals

A roller leveler said to flatten thin-gage sheet metals that cannot be properly handled by conventional levelers has been announced by Voss Machinery Co., 2882 W. Liberty Ave., Pittsburgh 16, Pa. The unit has ¾-in. dia. work rolls. It flattens alloy and perforated sheets from 0.010 to 0.030 in. thick and up to 28 in. wide.

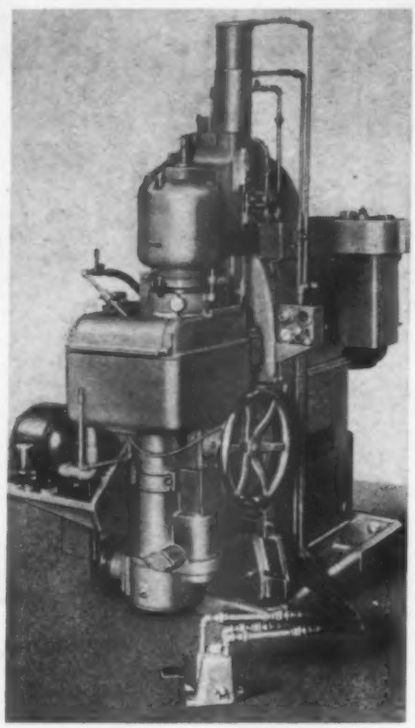
Known as the "Inverted Type Leveler," the unit has tiltable lower rolls, while the upper flight of rolls does not tilt. The control levers at the top of the machine are placed at the same end as the handwheel and the electrical controls for the variable-speed drive. This feature gives centralized control to the operator.

Sandusky Abrasive Sticks Grind, Clean, Hone, Polish

Flexible abrasive sticks have been added to the line of Sandusky Abrasive Wheel Co., 687 W. Ransom St., Kalamazoo, Mich. Made of abrasive grains bonded in rubber, they are used for jobs such as grinding, cleaning, deburring, honing and polishing. The sticks can be easily cut to fit the shape of the work or to reach hard-to-get-at places. They are available in three abrasive-grain grades: fine, medium and coarse.

The sticks may be used by hand or held in a lathe toolpost. Lengths are 3, 6 and 8 in. Size is from ¼-in. dia. to 8x1x½ in. rectangular. Blocks for large-area finishing are available in 4x4x¾-in. size.

Walker Vertical-Stroke Ginder Controls Spindle Hydraulically



Vertical rather than horizontal travel of the grinding wheel over the surface being ground is employed in this O. S. Walker grinder

A vertical-stroke grinder with hydraulic control of the spindle is a development of the O. S. Walker Co., Inc., Worcester 6, Mass. The spindle has rapid traverse to a predetermined point, feeds slowly under uniform pressure while the wheel grinds, then comes to a positive stop and returns rapidly to the original position.

The magnetic chuck is automatically magnetized and demagnetized during the spindle cycle. The chuck table can be tilted 2° backward and 5° forward. For bevel grinding, it can be tilted 15° left to right.

Control of the cycle is by a treadle which in many instances permits one operator to run two machines. Fingertip controls are provided for spindle, workable and coolant pump. The spindle can be equipped with a motorized head of any capacity or with vertical-belt drive. A wheel up to 12-in. dia. can be used with work handled up to 4 in. high.

Dorman Three-in-One Tapper Takes Three Types of Tools

A tapper designed for both external and internal threading to ⅜ in. in steel or any material that can be tapped has been announced by Dorman Machine Tool Works, Mount Vernon, N. Y. It will take (from left to right in illustration) machine or hand taps, round-split or button dies, or acorn dies. Any of the three types of tools can be used by removing four screws, inserting the desired tap- or die-holder assembly and replacing the screws. The operation is said to require less than 3 min.

Assemblies consist of die-holding clutch spindle, clutch bar, cover and reverse gear. No. 1-RS takes round-split or button dies; No. 1-AC takes acorn dies; No. 1-ST takes all standard taps. The assemblies may be used with any No. 1 Dorman tapper. There is a parallel group for use in No. 2 tappers which have ⅞-in. capacity in steel.

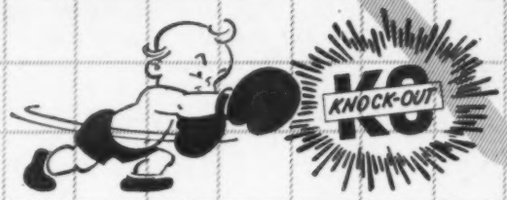
Denison "Multi-Speed" Feature Standard on Multipress Units

"Multi-Speed" control is now standard on all basic Multipress units (See *AM*, June 6, 1946, p. 166 and June 19, 1947, p. 192) made by The Denison Engineering Co., 1160 Dublin Rd., Columbus 16, Ohio. The feature provides rapid ram speed for approach and regulative speed for pressing.

Levers can be slightly moved when the ram is at any point of downward travel, resulting in changed ram speed for remainder of stroke. A knurled-knob adjustment screw regulates pressing speed. Adjustable stop-collars on shipper rods limit upward and downward ram travel.

The new feature is standard at no added cost. It makes the presses adaptable to many more operations than with previous design.

Tool Maintenance Costs Come Down...

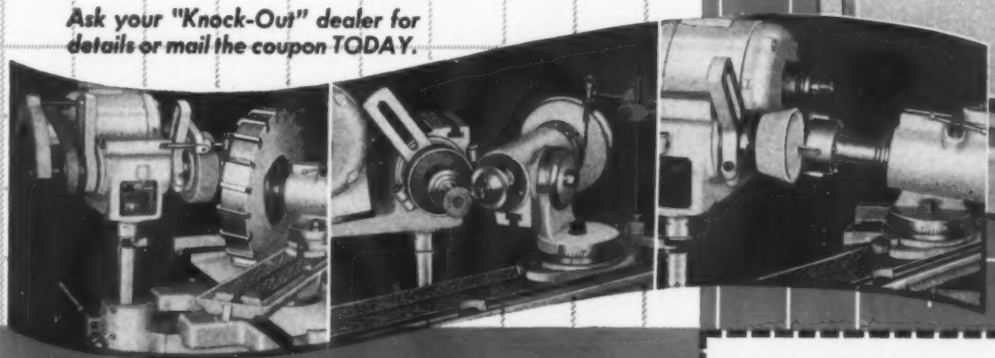


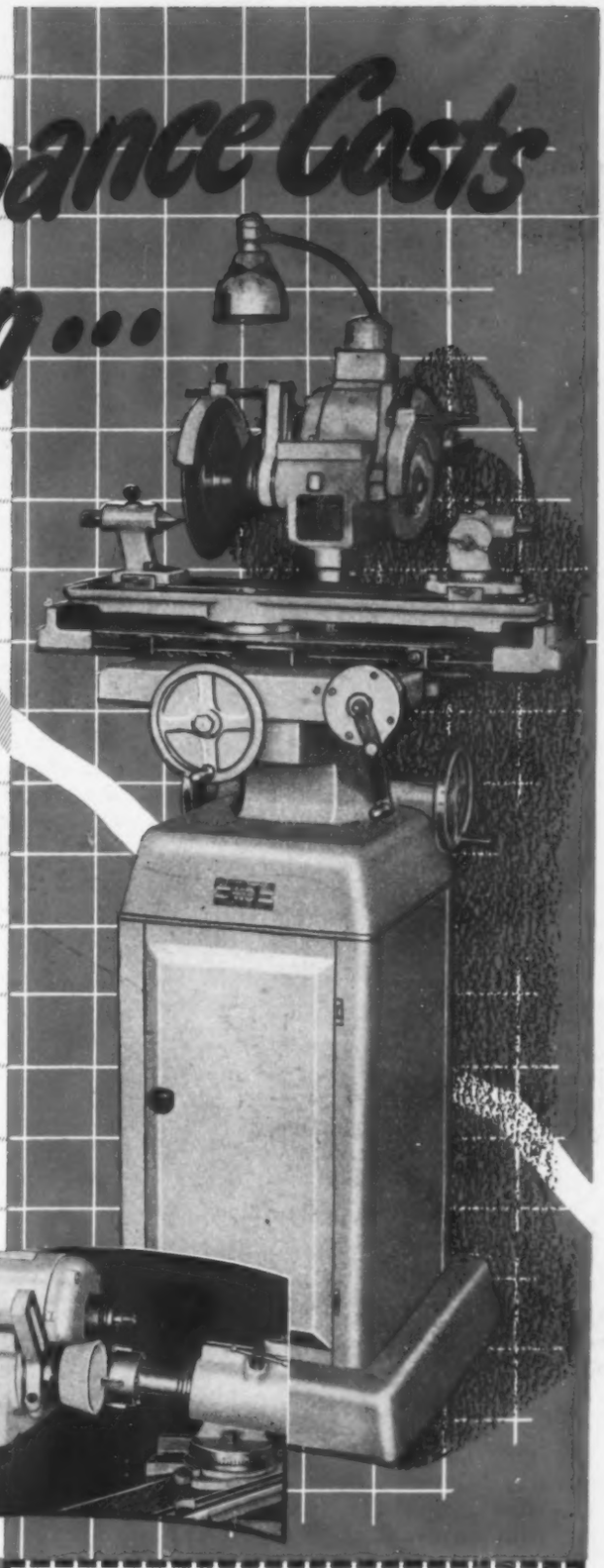
WHEN YOU USE A "KNOCK-OUT" Universal Cutter Grinder

Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lost between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A "Knock-Out" Universal Cutter Grinder is the busiest machine in any Tool Room.

Ask your "Knock-Out" dealer for details or mail the coupon TODAY.





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7

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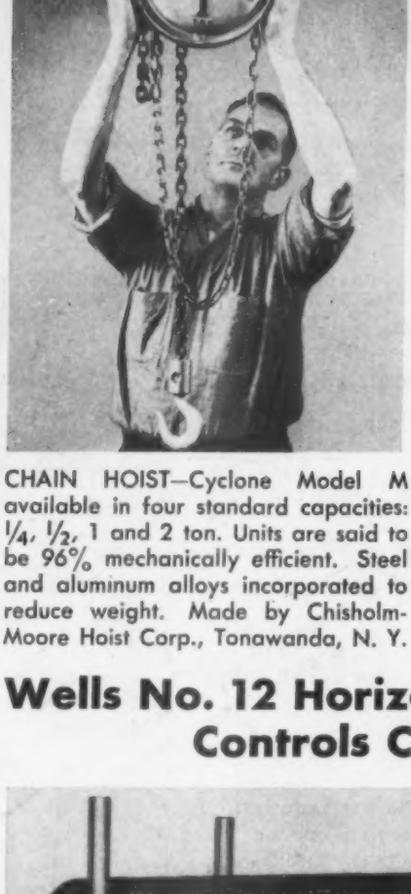
Westinghouse Synchro-Trol Directs Resistance Welders

The Synchro-Trol line of packaged synchronous-precision ac. resistance-welding controls is made by Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Eight factory-wired subunits and five supplementary subunits permit a wide variety of combinations for timing and sequencing. The controls may be side- or floor-mounted. Design of the line is similar to the Weld-O-Timer line of non-synchronous controls (see *AM*, June 19, 1947, p. 196).

Gelber's Star Live Centers Have Tips Ground on Own Axes

The Star live center is manufactured by Samuel S. Gelber Co., 542 W. Washington Blvd., Chicago 6, Ill. With no overhang and having the same general dimensions as a standard dead center, it has ground thrust-type ball bearings and Oilite radial bearings. Tips are ground on their own axes. The shaft turns in a concentrated anti-scoring lubricant said to withstand more than 50,000 psi. pressure.

Four models have taper from No. 2 to No. 5 Morse, load and thrust capacities from 250 to 600 lb., and over-all length from 4½ to 9 in.



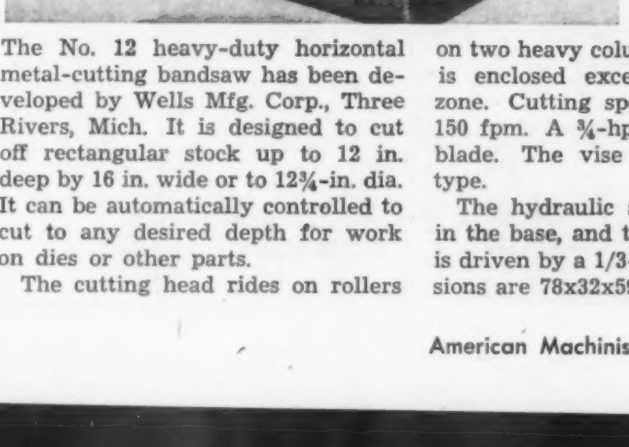
CHAIN HOIST—Cyclone Model M available in four standard capacities: ¼, ½, 1 and 2 ton. Units are said to be 96% mechanically efficient. Steel and aluminum alloys incorporated to reduce weight. Made by Chisholm-Moore Hoist Corp., Tonawanda, N. Y.

Foulk Centerless-Grinder Blades Have Insert-Type Construction

A line of Ampco Bronze centerless-grinder blades is announced by The Foulk Mfg. Co., 4208 Airport Rd., Cincinnati 26, Ohio. The blades are recommended for use when grinding materials that "pick up" or score easily, such as stainless steel, Monel metal or aluminum.

Quick-change insert-type construction is used, permitting the use of many inserts with one or two blade bodies. Ampco Bronze is said to outwear blade materials, such as cast iron, which are normally used in grinding stainless steel.

Wells No. 12 Horizontal Bandsaw Controls Cut to Desired Depth



The cutting cycle of this bandsaw is automatic. The blade is fed into the work at constant pressure, and the cutting head is returned by hydraulic power to starting position above the work upon completion of cut

The No. 12 heavy-duty horizontal metal-cutting bandsaw has been developed by Wells Mfg. Corp., Three Rivers, Mich. It is designed to cut off rectangular stock up to 12 in. deep by 16 in. wide or to 12¾-in. dia. It can be automatically controlled to cut to any desired depth for work on dies or other parts.

The cutting head rides on rollers on two heavy columns. The sawblade is enclosed except at the cutting zone. Cutting speeds are 50, 90 or 150 fpm. A ¾-hp. motor drives the blade. The vise is a quick-acting type.

The hydraulic system is enclosed in the base, and the hydraulic pump is driven by a 1/3-hp. motor. Dimensions are 78x32x59 in. high.

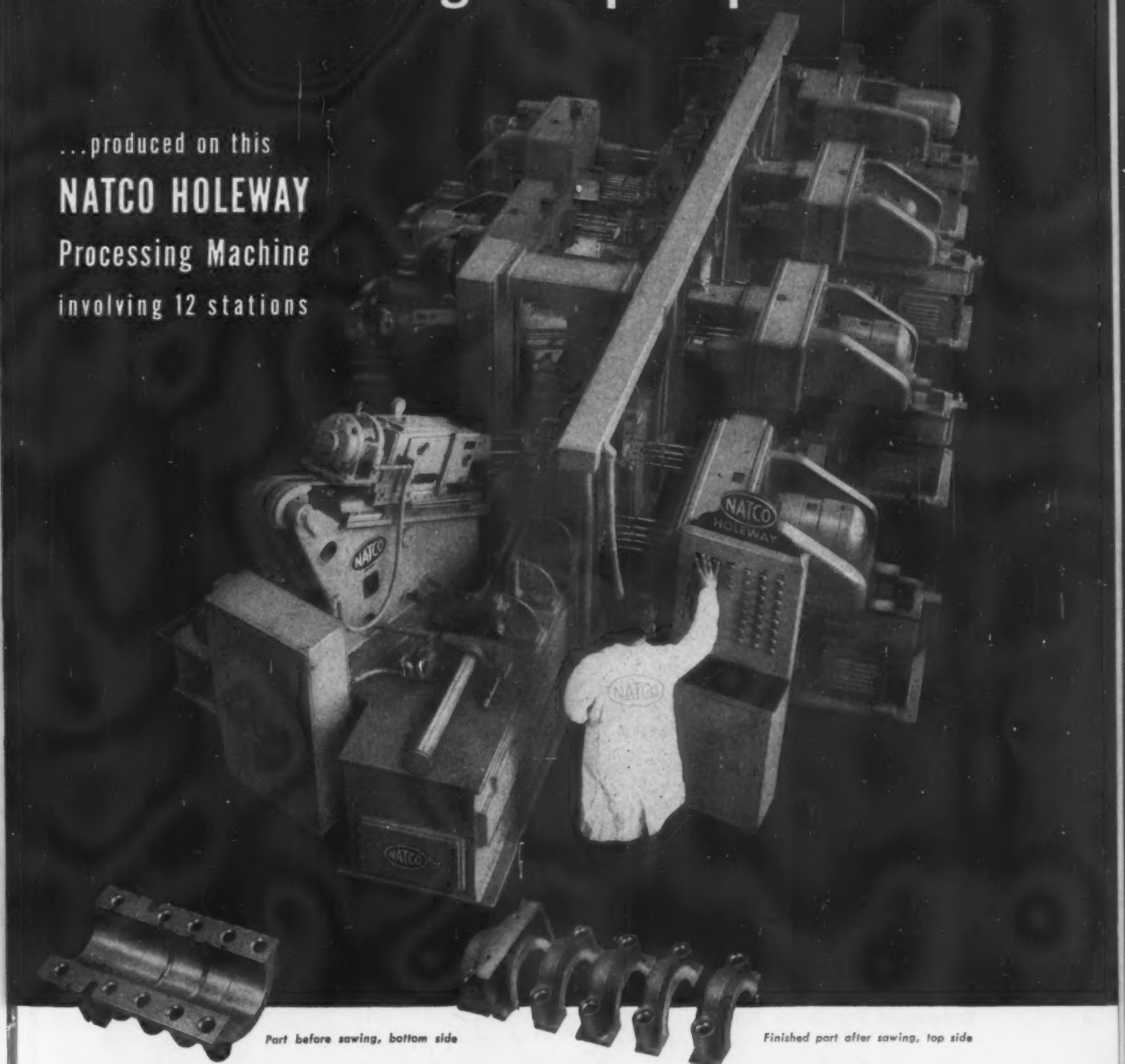
475 Bearing Caps per Hour

...produced on this

NATCO HOLEWAY

Processing Machine

involving 12 stations



Part before sawing, bottom side

Finished part after sawing, top side

One man on this NATCO HOLEWAY Processing Machine produces 95 of these bearing cap sets (475 individual bearing caps) per hour

• In keeping with the trend to automatic handling — less operator fatigue and more production per man — NATCO provides this processing type machine arranged to complete the following operations between loading position # 1 and unloading position #12: drills 20 holes; mill chamfers both sides of center bearing; drills 2 angular holes; combination drills and countersinks 2 holes; chamfer 10 holes; taps two holes; countersinks 10 holes; spotfaces 10 holes; mills 5 bearing liner lock notches; saws finished bearing casting into five component parts as shown above—and unloads automatically.

NATCO

Write today for NATCO Machine Circular 145-A

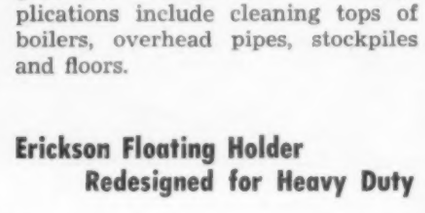
NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, INDIANA, U. S. A. • *Branch Offices:* 1809 Engineering Building, Chicago • 409 New Center Building, Detroit • 1807 Elmwood Avenue, Buffalo • 2902 Commerce Building, New York City

Breuer Tornado Portable Unit Cleans with Vacuum or Blast

An improved Tornado portable industrial vacuum cleaner is announced by Breuer Electric Mfg. Co., 5084A N. Ravenswood Ave., Chicago 40, Ill. It also can be used as a portable blower by removing the motor-fan unit and directing it by hand in any position. A 295-mph. blast of dry air can be obtained this way and can be used for cleaning generators, shafting and stock shelves.

For suction cleaning it takes up 185 cfm. of air with 49-in. waterlift. Lighter dust goes into the bag, while heavier matter bypasses the fan and goes into a 12-gal. steel tank. Applications include cleaning tops of boilers, overhead pipes, stockpiles and floors.

Erickson Floating Holder Redesigned for Heavy Duty



The Erickson adjustable floating holder for Brown & Sharpe "00" Automatics has been redesigned for heavy-duty use. Made by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio, it has heavier flanges and adjusting screws. Overhang has been reduced to 27/32 in. to increase rigidity and clearance.

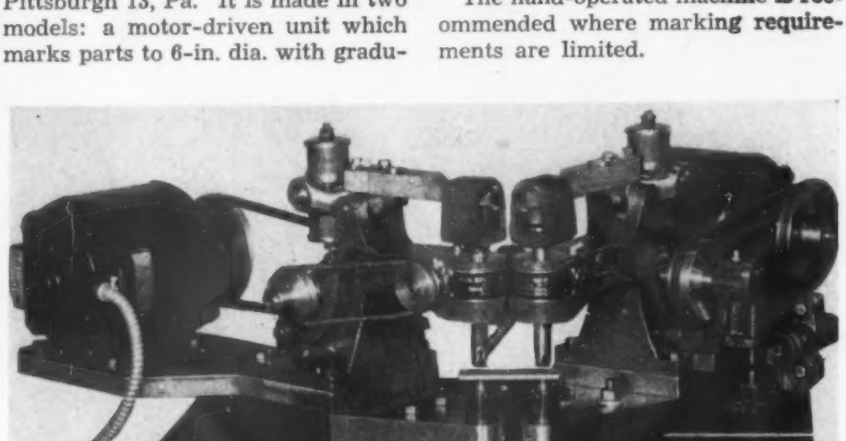
The same collets are used as before. Each size has 1/32-in. over-all collapsibility. The holder grips along entire length of collet. Range is from No. 80 (0.013-in.) to ¼-in. drill.

Cylindrical, Cone-Shaped Parts Marked on Matthews Machine

The No. 203 marking machine for precision marking of cylindrical or cone-shaped parts such as machine-tool feed dials is announced by Jas. H. Matthews & Co., 3956 Forbes St., Pittsburgh 13, Pa. It is made in two models: a motor-driven unit which marks parts to 6-in. dia. with graduation numbering and a small amount of lettering, and a hand operated bench model for marking parts to 3-in. dia. with graduations and numbers.

The motorized unit is said to mark parts as fast as they can be clamped. It has one roller die with dial-holding shaft. The ½- or ¾-hp. geared-head motor operates drive shaft at reduced speed of 45 rpm. There is one set of beveled gears for cone-shaped parts or one set of spur gears for cylindrical parts. Gears are made to order, depending on size of parts to be marked. The work-holding fixture is designed to order.

The hand-operated machine is recommended where marking requirements are limited.



RIVETING UNIT—2AHD bench-type hammer has two heads, forms two rivet heads simultaneously. Minimum center-line distance is 2¾ in., maximum is 12 in. Capacity is ⅛- to 5/32-in. dia. rivet. Different types of units can be fabricated by The High Speed Hammer Co., Inc., 313 Norton St., Rochester 5, N. Y.

BLUEPRINTING MACHINE—M4 Automatic produces blueprints, whiteprints, vandyke prints and blueline prints. Infinite speed range from 6 to 32 fpm. Unit incorporates Revolving Contact principle: tracing and sensitized material are gripped between cylinder and contact band, and all move together at same speed. Contact is said to be slip- and static-free. Prints are spray washed and then dried on drums in unit. Made by Paragon-Revolute Corp., Dept. AM, 77 South Ave., Rochester 4, N. Y.

Simplify and Save on Hydraulic Systems with VICKERS POWER UNITS

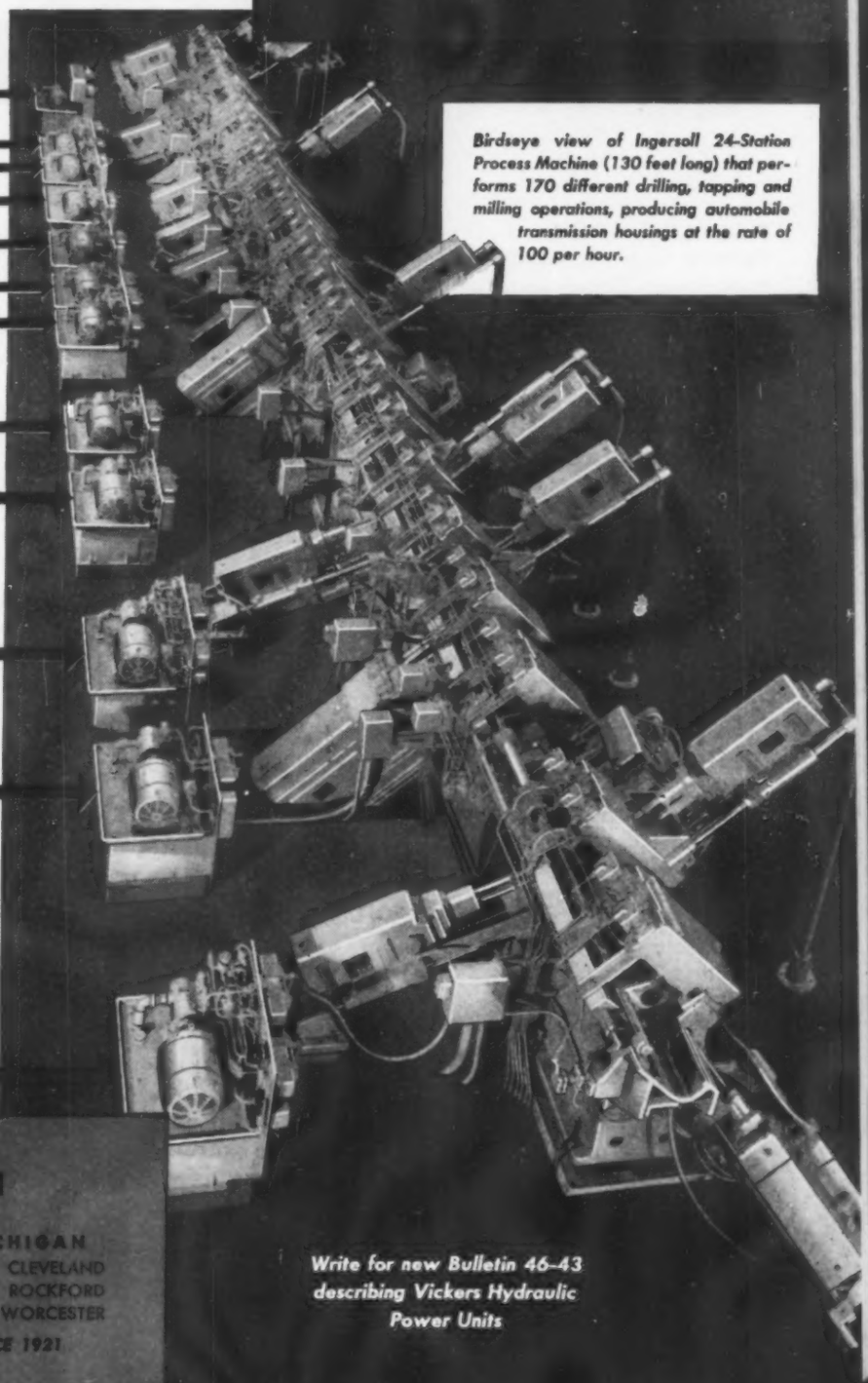
The "hydraulics" on this Ingersoll 24-Station Process Machine transfers the transmission castings from station to station and provides power for clamping, locating and chip disposal. The hydraulic system design was simplified and cost reduced by using the twelve standard Vickers Self-Contained Hydraulic Power Units shown.

These units provide a compact hydraulic power package which can be applied to almost any system. They are available with various pump combinations to meet a wide range of requirements up to pressure demands of 2,000 psi. There are 92 standard sizes and types of single stage, two stage and dual pressure pumps equipped with motors from ¾ to 20 hp.

The oil reservoir serves as a base to save floor space. On it is mounted a standard Vickers Motorpump or a Vickers pump with separate motor drive. A Vickers "balanced piston type" pressure relief valve provides accurate control of hydraulic pressure. A simple wrench adjustment sets maximum operating pressure at any desired figure within recommended pressure range. Filters and reservoir are readily accessible for cleaning. See Bulletin 46-43 for the many other features.

Vickers Hydraulic Power Units are frequently the most desirable source of hydraulic power. Vickers application engineers will be glad to discuss your hydraulic power and control problems.

3158



Birdseye view of Ingersoll 24-Station Process Machine (130 feet long) that performs 170 different drilling, tapping and milling operations, producing automobile transmission housings at the rate of 100 per hour.

Write for new Bulletin 46-43 describing Vickers Hydraulic Power Units

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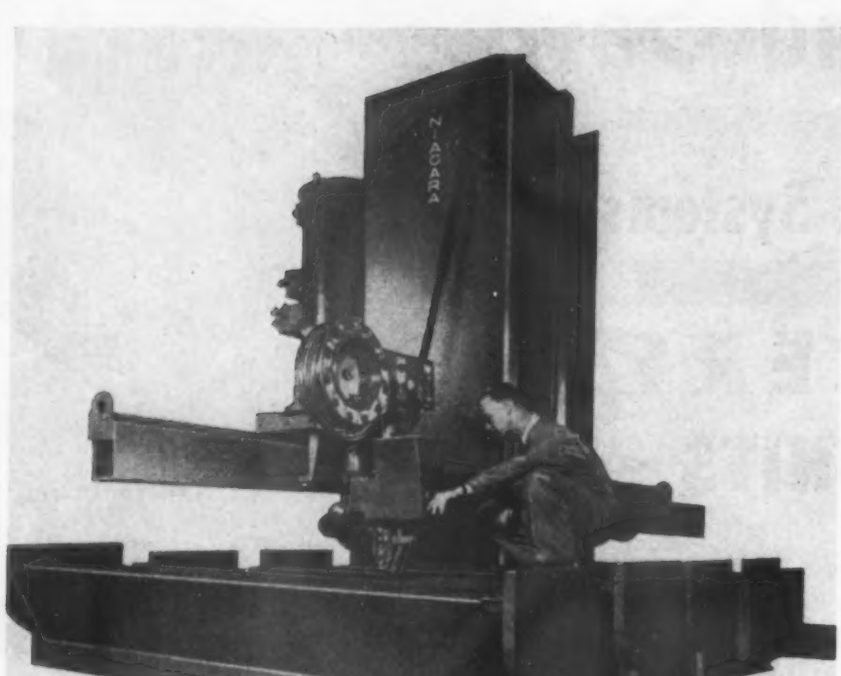
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



ELECTRONIC WELDER—Automatic unit has electronic control which provides variable speed of machine along track. Length of weld governed only by track length. Welds perpendicular to track accomplished by traveling welding head along cantilever beam. Unit requires one operator, has centralized push-button station for all welding adjustments and machine movements. Made by Niagara Machine and Tool Works, 683 Northland Ave., Buffalo, N. Y.

Airco Wypo Tip-Cleaning Sets Clean Welding, Cutting Tips

Wypo tip cleaners have been announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. For cleaning oxyacetylene-welding and cutting tips, they are available in two sets.

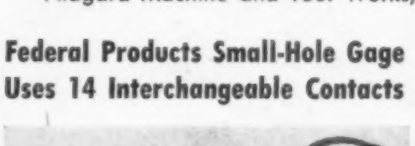
Set No. 1 has 12 cleaners for drill sizes ranging fro mNo. 75 to No. 49. Set No. 2 has nine cleaners for drill sizes ranging from No. 48 to No. 30. Tip cleaners are made of stainless steel. Sets come in leather cases.

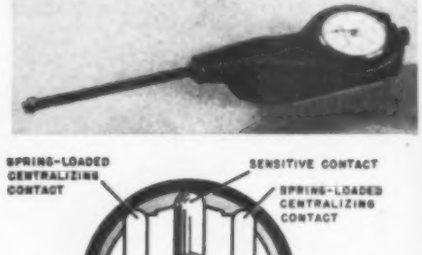
Two New Malnar Developments Used on Bridgeport Miller

An arbor support for horizontal milling on a Bridgeport is announced by Malnar Machine & Tool Co., 19301 St. Clair Ave., Cleveland 10, Ohio. It is used in conjunction with the "Malnar Horizontal Unit" (see *AM*, Feb. 13, 1947, p. 176). The operator now can do end and horizontal milling with the Malnar and vertical milling with the Bridgeport.

Also announced is the Malnar variable-speed unit for use with the "Horizontal Unit." Spindle speeds can be varied from 10:1 reduction on a constant-drive pulley setup.

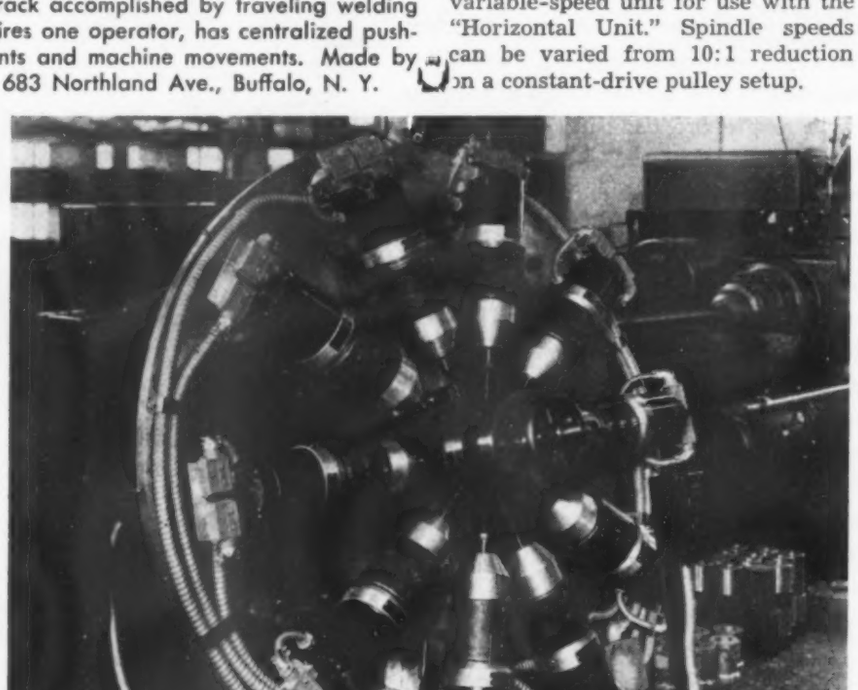
Federal Products Small-Hole Gage Uses 14 Interchangeable Contacts





The Model 1204 self-centralizing small-hole gage is made by Federal Products Corp., 1144 Eddy St., Providence, R. I. It employs 14 interchangeable contacts to inspect a range from 0.250 to 0.500 in. It explores holes to max. depth of 2¼ in. and will reveal diameter, roundness, taper, bellmouth and other inaccuracies in tenths of thousanths.

The gage comes complete with adjusting wrenches and extension or extensions required. It is adjusted for a particular dimension with proper master ring.



SPECIAL MACHINE—Automatic brake-band drilling unit made by Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich. Automatic transmission bands and lining are clamped manually in work-holding fixture. Operator presses button and fixture moves by air pressure through two positions and returns to original position. Ten holes are drilled at each position, making a total of 20, by drill units

Adapt Any Milling Machine For Rotary Milling And Indexing Work In A Few Minutes

with

KNIGHT'S

20" ROTARY TABLE

SEE IT IN OPERATION!

1947 MACHINE TOOL SHOW CHICAGO SEPT 17-26

- Use it on any milling machine, horizontal boring mill or work bench
- Virtually eliminates all set-up time
- No installation — just plug it into nearest electric outlet
- Geared down motor provides ample power
- No other equipment or connections necessary
- May also be used as automatic revolving fixture

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ROUND TABLE *Discussion*

DO ROLLING STONES GATHER POLISH?

Rolling stones of the type "A1" and "Ed" were discussing probably don't gather a lot of moss, if moss is synonymous with money, but they gather a lot of experience and are often not only first-rate, versatile craftsmen, but more worldly wise and level-headed than the stay-at-home paragon with no ideas outside his own town.

Some men are born with a wanderlust. Neither pay nor status will keep the true rolling stone in a job for long, but that is no reason why good use of these birds of passage should not be made. You can generally tell the type, and put him where his talents will have scope, but not where he is a key link. Such men are usually good workers, because their wanderlust costs money, if it is to be satisfied; hence, when on a job, they usually give of their best in order to earn good pay. Rolling stones do have their value, rightfully placed.

K. N. Harris
Harrow, England

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SNOOPERVISOR

Some years ago I had contact with the habits of a so-called snoopervisor. Bill, my immediate superior, was a mechanical engineer whose many successful undertakings were preceded by intensive research. Bill was a fine character and was well liked by his associates. He prided himself in having built up personal habits for the express purpose of promoting the greatest possible efficiency in anything that he undertook to do. Unlike a great majority of his industrial contemporaries, Bill moved with determination at all times. He was a jump ahead of our friend Al in that his system was less expensive and considerably more flexible. He used cards, about 3x5 in., held together by a rubber band. On these he wrote with a self-styled shorthand. Any thought, no matter how trivial, was important enough to be the sole occupant of a card.

Bill always entered the engineering office and smilingly bid each fellow a friendly good morning, hung up his coat and hat and then put on his shop coat. After looking over his mail and dictating the re-

Gairing Standard THREADED HOLDER showing Adjustable Stop Nut
Gairing Standard CORE DRILL with Interchangeable Cutter
Gairing Standard type C COUNTERBORE with Interchangeable Cutter and Pilot
Gairing Standard Block-Type BORING BAR showing "quick-change" Cutter Block

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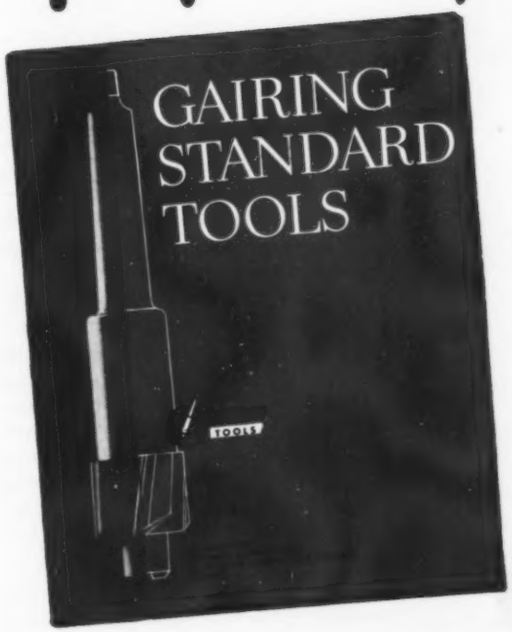

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All these are tools of general application, made in standard designs and generally available from stock. All are based on the economy principle of interchangeable cutters and some of them have been made by us for as long as thirty years.

Completely catalogued are: interchangeable counterbores, threaded holders, full floating holders, tungsten carbide tipped counterbores, back spotfacers, core drills, micro-nuts and hollow mills. A few pages are devoted to an introduction of the block-type boring tools and some of the more generally used special tools like multi-diameter cutters, carbide-tipped cutters and milling cutters.

THE GAIRING TOOL COMPANY

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LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

plies, he made certain he was supplied with a pack of clean cards, entered the clattering shop, and proceeded to stroll around the many machines to gather food for thought.

Occasionally he encountered a workman who, through ignorance or deliberate opposition to progress, looked upon his observation with grave misgivings. The snoopervisor paid no attention to this because he considered that the job he was doing was his and that he was looking after the interest of the company. Any benefits to the company he considered would eventuate to the interests of the workers. The greater number of the men he contacted, however, were broad-minded individuals who understood the wisdom of efficient observation.

It is a good thing that the worker as a general rule believes in the necessity of the firm's exercising whatever methods are necessary to establish manufacturing efficiency. If we are going to let a few complaining individuals determine our course, how are we going to maintain our industrial and technological supremacy? We have gained this through intensive observation and research to which the little black book or the cards have had their contribution.

There is an old Chinese proverb that fits Al's book and Bill's cards: "The strongest memory is weaker than the palest ink."

•

J. Homewood
Ontario, Calif.

Ed has the idea that, because Al carries a little black book in which he makes notes on the job, the boys will think he is making notes in the book which will reflect on their shortcomings. I believe a supervisor who has a goodsized gang is responsible for a variety of operations, and is on his toes, must carry some sort of memorandum book.

The type of supervisor, who was nick-named the Snoopervisor, used to be a favored individual with management years ago. Such a type did make men suspicious, but happily this sort of supervisor has been about wiped out. Employers have found that such men breed trouble and they are very careful to hire a man thoroughly trained for the job.

As a matter of fact, due to the superior type of supervisor today, out of the hundreds of strikes during the last five years, only about a dozen of these were due to disagreements over a supervisor.

Many years ago, in a plant where

When the job calls for a soluble cutting fluid . . .

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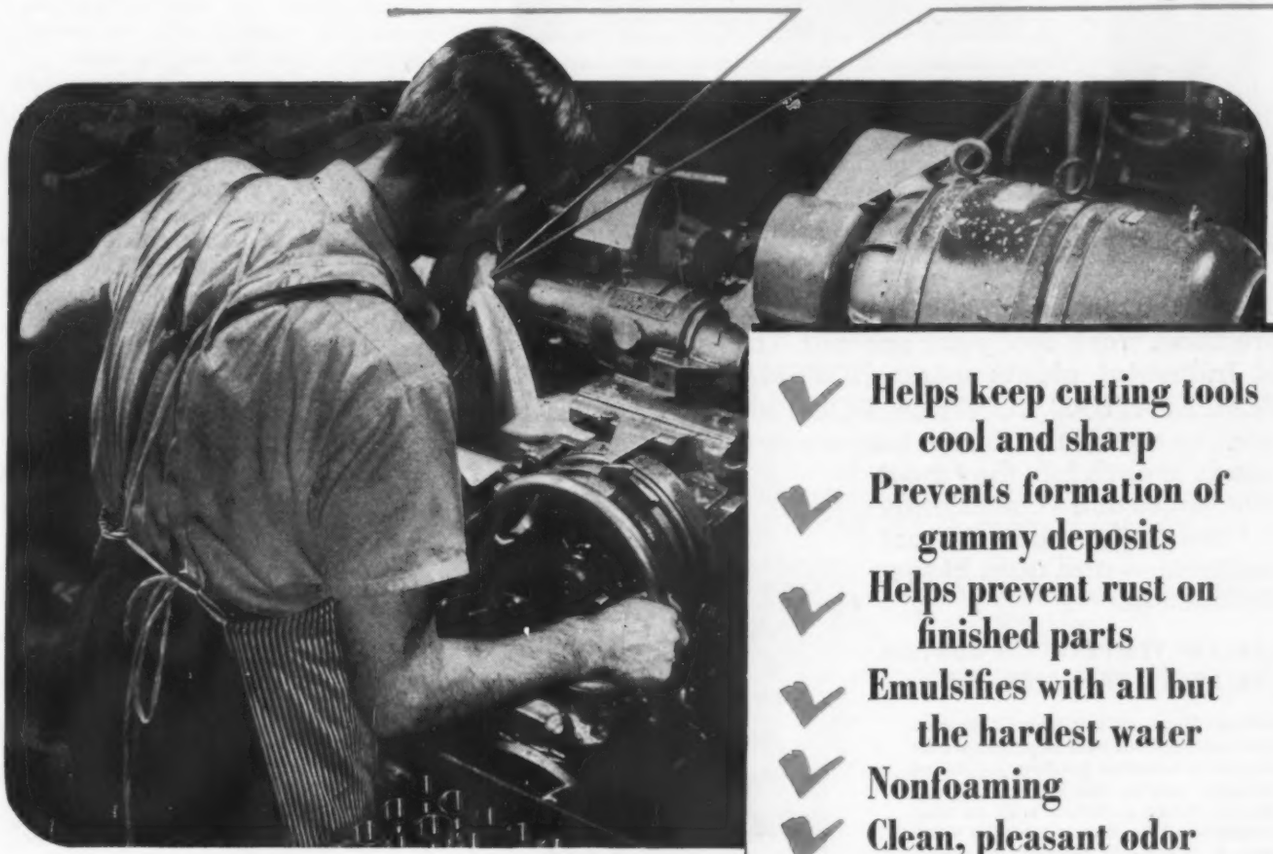

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THE NEW GULF SOLUBLE CUTTING OIL combines the qualities you need to get improved production, increased tool life, and reduced down time for tool changes.

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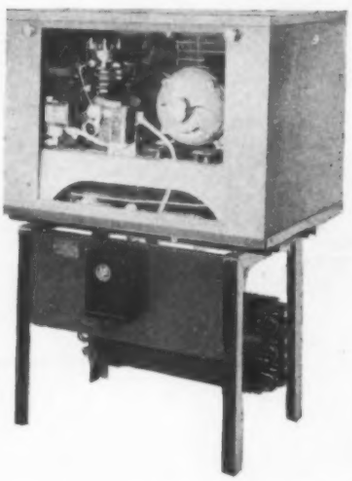
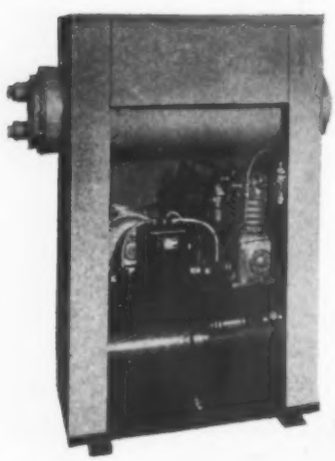
COOLANT TEMPERATURE CONTROL FOR EVERY PRECISION JOB

Hoffman Units are available either with immersion coils or with heat exchangers capable of handling full flow. For thread grinding, lapping and honing, and machining certain materials such as magnesium—and for high production work, there is a Hoffman temperature control unit to serve all standard machines using an oily coolant.





(*Above*) Front view of 1 H.P. Type A Unit, with aircooled condenser and 15½ gallon per minute capacity. (*Left*) 3 H.P. Unit with watercooled condenser and 600 gallon per minute capacity. A Hoffman Engineer will help you determine your requirements.

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COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

I was employed, a young man who was an exceptionally bright machinist was placed in the position of assistant superintendent. He kept himself busy by looking for anything he could report to his boos, noting any small infraction of the rules.

After he had been on the job two weeks he presented a written report to the superintendent. Among other things, he suggested that a man be appointed for the sole purpose of seeing that employees did not spend too much time in the restroom.

After thinking over and studying the report, the superintendent sent for the assistant and said, "John, I have been thinking of the advisability of having a man check up on unnecessary time spent in the restroom, and as you have failed on the job to which you were assigned, that of helping to increase the efficiency of the department, I have decided that it might be a good idea to put you in charge of seeing that no time is wasted in the washroom."

The bright young man decided the wisest thing to do was to separate himself from the concern—to the satisfaction of all concerned.

Arthur Silvester
Niantic, Conn.

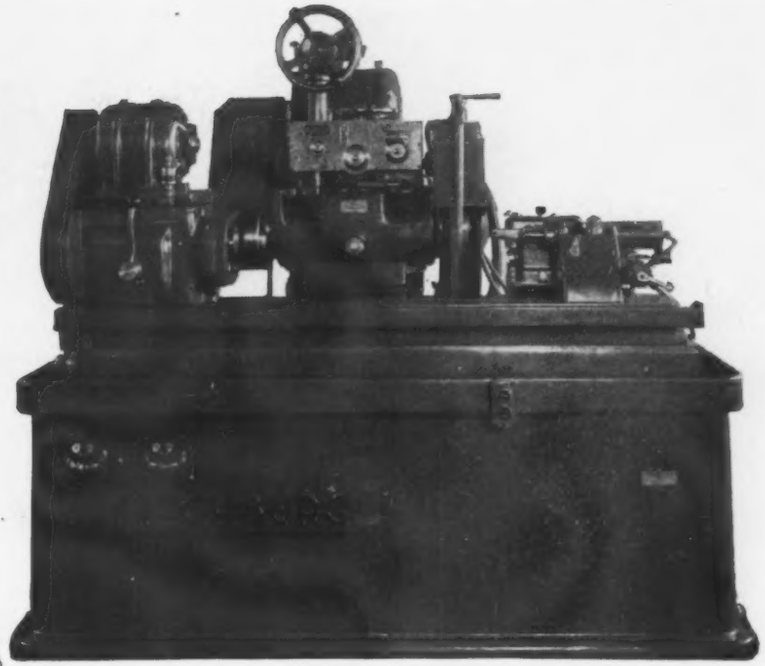
•

CAN TOOLMAKING BE SUBDIVIDED

Al's experiment seems like a good thing in that it is a step towards promotion of greater efficiency in a department where the time element is worthy of serious consideration. On the surface there appears to be no objection to a workman doing his own calculating; however, if such tasks were to be performed by one particularly adapted to that type of work, it is a cinch that the figure manipulating would be done in considerably less time and the results would undoubtedly be more accurate. The chance of errors occurring from having each individual performing his own mathematical problems is almost certain, in spite of the fact that we have some shrewd mathematicians who play around with micrometers and monkey wrenchesl. There may be some who strenuously object to letting a mathemechanic work out his special pet problems—they may look upon the idea as an infringement.

I feel certain that a great number of workmen would relish the idea of having another perform their figuring. All workers are not trained to calculate their own problems, even though they may have gone through the fundamentals in school. This

Why Fitchburg PUSH-BUTTON GRINDING is lower cost GRINDING...



INEXPENSIVE FIRST COST

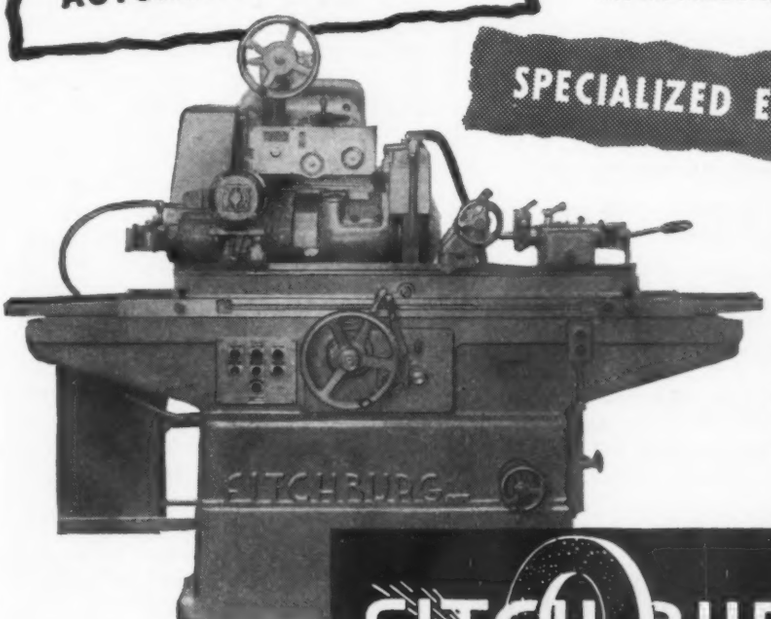
We can design special cylindrical grinding machines inexpensively because in the FITCHBURG BOWGAGE WHEELHEADS we have the most efficient, completely automatic cycle Wheelheads ever designed—all ready to be installed on a suitable base. The Bowgage Wheelhead is a standard item for which you pay *standard* prices.

MAXIMUM PRODUCTIVITY

Your FITCHBURG Grinder will be *truly productive*—making the maximum use of the most modern, low-cost grinding techniques: formed wheel grinding, simultaneous grinding of multiple surfaces, Fitchburg Automatic Size Control, etc. All these guarantee that your Fitchburg Grinders will give you an amazingly low cost per piece.

AUTOMATIC PRECISION

All the precision you can possibly want—grinding to limits as low as .00005"—automatically, by simply pushing the "Start" button. The machine stops itself when the final size is reached.



SPECIALIZED EXPERIENCE

FITCHBURG has for more than 25 years specialized in designing and building special automatic mass-production grinding equipment. You get the benefit of this experience in the low figures on our bill.

We may already have a design that will perfectly suit your needs. An inquiry—with part prints if possible—will in no way obligate you.

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Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders

Nine Out of Ten Can Reduce Tool Expense!

Nine out of ten plants that provide their employees with tools can cut tool costs. You can reduce yours, whether you have one or a dozen cribs, production or maintenance tools.

Factual reports from users of McCaskey Tool Crib Control point the way. For example, Mr. M. L. Borden, Tool Supt., Crocker-Wheeler Electric Manufacturing Co., recently stated that as a result of McCaskey Control:

1. They have reduced tool stocks three times—are operating with 40% less but with more and better tools of the right kind. Far more production with less tools.
2. They have reduced tool purchases approximately 60%.
3. Breakage has been reduced 40%, whether caused by operator, method or operating condition.
4. Better than $3000 in small tools, considered lost, were returned.
5. Employees are served at the cribs in a third the time with brass checks. Lost time of men and machines at minimum.
6. Number of tool cribs and attendants reduced.
7. System furnishes wealth of information at a glance with small investment for installation and operation.

Write today for "Guard Your Tools" by Mr. Borden, from which these facts are taken and similar reports from several equally well-known plants. Or, let us have a representative explain without obligation, how McCaskey will help you cut *your* tool expense.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada The McCaskey Register Co., Watford, England

does not mean that they are not first-class mechanics.

I'd venture to hazard a guess that there are some fellows who, from the very beginning of their shop careers, have deliberately shunned the thoughts of having to struggle with any kind of arithmetic. Bill Jones, let us say, may be particularly allergic to "figgers" and may think that a square root grows on some kind of tree in the wilds of Africa—nevertheless he is a valuable man to his foreman. I still think that Al has hit upon something that will do its share in making for greater effectiveness in toolroom procedure.

J. Homewood
Ontario, Calif.

•

Al's new man, whom he designated as his "mathemechanic," has been unofficially in existence as long as there have been toolrooms. There have always been problems to work out and there has always been some bright man at figures who was only too anxious to help solve them. However, I don't approve of Al introducing his socalled mathemechanic for these reasons:

In a good-sized toolroom today there is a toolroom foreman and an assistant foreman, and in most toolroom offices there is a man who can do sketches and simple drawings of tools and gadgets and other parts to be made that are a necessary part of toolroom production, which the design and drafting office don't bother with. These three men are, as a general rule, highly qualified in mathematics, one of the chief qualifications of a toolroom supervisor. There are also several tool inspectors who can figure out the various figure problems that inevitably crop up in the regular day's work, or else how could they efficiently inspect and pass a jig or fixture into production?

If with all this help available to the superintendent of the toolroom to explain anything that puzzles the shop men, a correct answer for any problem cannot be arrived at, then the need is not for a mathemechanic, but for a new toolroom supervisor. It also should be remembered that the vast majority of toolmakers are generally above the average at figuring.

Of course, if Al needed additioanl help in supervising, and he did not have a righthand man to help him, he would be wise to get a man, who, apart from being a smart toolmaker, was also smart at figuring blueprints, and a whiz at figures.

Four or five years ago, in a large

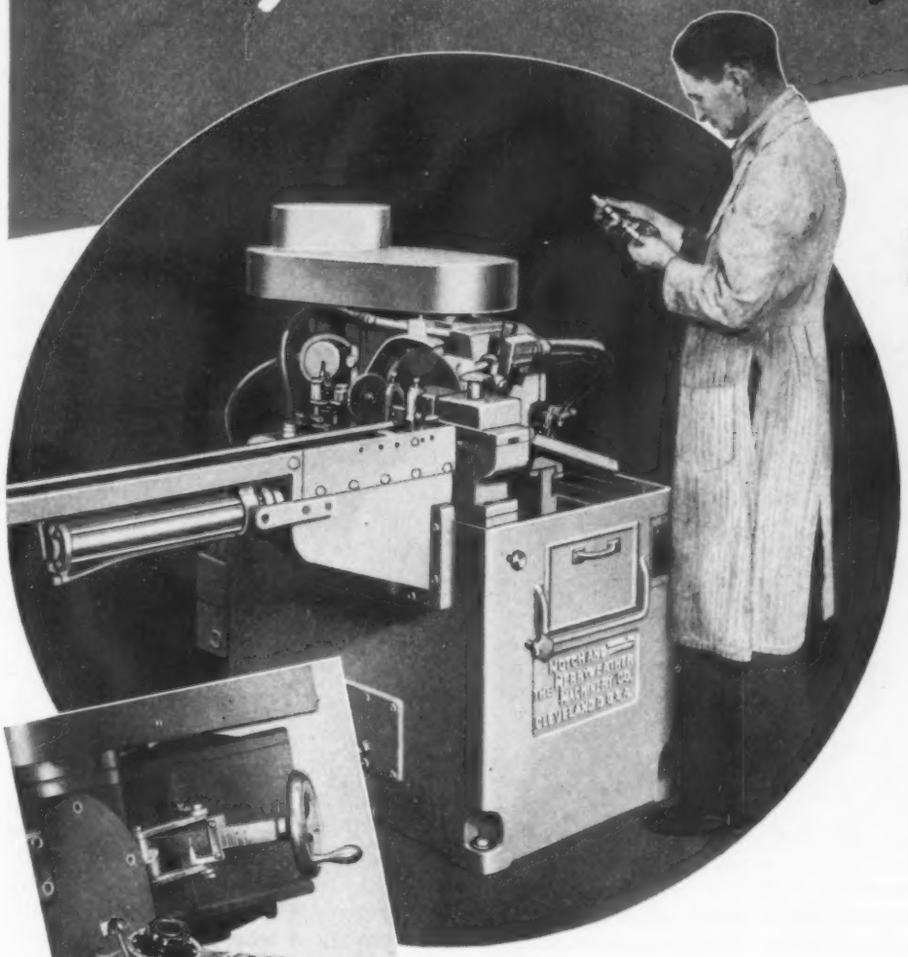
The Answers are Here . . .

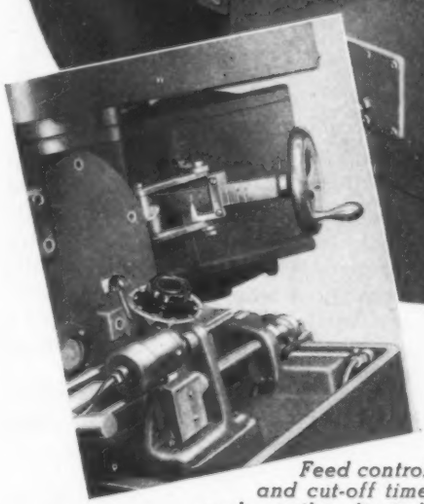
in the Motch & Merryweather

No. 00

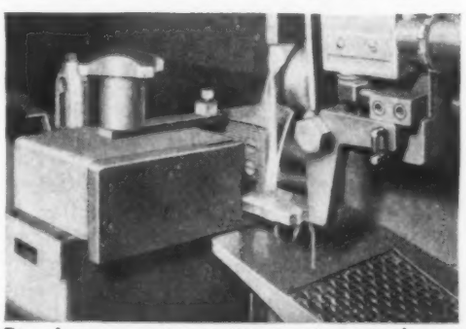
CIRCULAR SAWING MACHINE

Triple-Chip METHOD





Feed control and cut-off time cycle easily adjusted.



Simple, accurate, positive-acting stock stop starts automatic clamping and sawing cycle.

All the proven fundamentals of Motch & Merryweather design and construction which insure smooth, clean, burr-less sawing and eliminate most second operations. Accurate, uniform lengths; high speeds; quick change from size to size and material to material for stock up to 2". Thorough-going Motch & Merryweather engineering has provided Triple-Chip blades to fit and a blade sharpener to grind them — an experience based on "building all 3". The answers within this range of work are here.

For more information write for our well illustrated Bulletin A-700.

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OVERLOOKED EXPENSE ITEMS *with*

"KEX"

INDUSTRIAL WIPING TOWELS

IN THESE DAYS when it is so necessary to keep operating costs at a minimum, it may be well for you to look into your small expense items that may have been overlooked.

Is "price buying" of scrap rags and waste really wasting money in scratched surfaces on expensive, highly sensitive machinery?

One way to reduce such unnecessary cost is to use KEX National Service from your local authorized distributor. KEX Industrial Wiping Towels are brought to you on regular schedules in any quantity, as you need them.

KEX Industrial Wiping Towels are uniform in size and made from new, soft textured fabrics woven to specification for Industrial use. Edges are bound to eliminate fraying and catching onto machinery. KEX towels are made for wiping. They are not discarded fabrics that have served their purpose in some other capacity. There are no hard seams, no forgotten buttons to mar delicate, sensitive surfaces.

Rent Kex Industrial Wiping Towels and Watch Costs Go Down. Nothing to buy—no expensive inventory—just a low monthly rental. The first month you use this service should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX National Service, 295 Fifth Avenue, New York 16, New York.

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"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

gun shop where I was employed in the toolroom, three or four toolmakers would often work together to figure out some problem from a blueprint. On one occasion, several angles were given on a fixture to be made for a breech mechanism, and from the result obtained, the dimension necessary to machine the breech block. As we were not sure whether their figures were correct, the superintendent went to the chief engineer's office. After the superintendent explained the problem, the chief said, "I am glad you brought this to my attention. We don't want you fellows in the shop working out problems to get final measurements. That job is strictly the design and drafting room job. I will not only have correct dimensions worked out and put on this blueprint, but will also have all our blueprints checked so in future you will not have to figure anything out. All necessary figures and dimensions will be shown plainly on the blueprint."

This was carried out and resulted in many hours of labor being saved. Not only that, it prevented errors being made in the toolroom.

Arthur Silvester
Niantic, Conn.

•

CAN YOU AID THE LEMON?

I have often tried helping the "lemon" and have afterwards wondered whether it paid off when the results were campared with other men's reactions. I have gotten good results from the lemon, but other workers are inclined to think you are a screwball for putting out the effort to befriend that type.

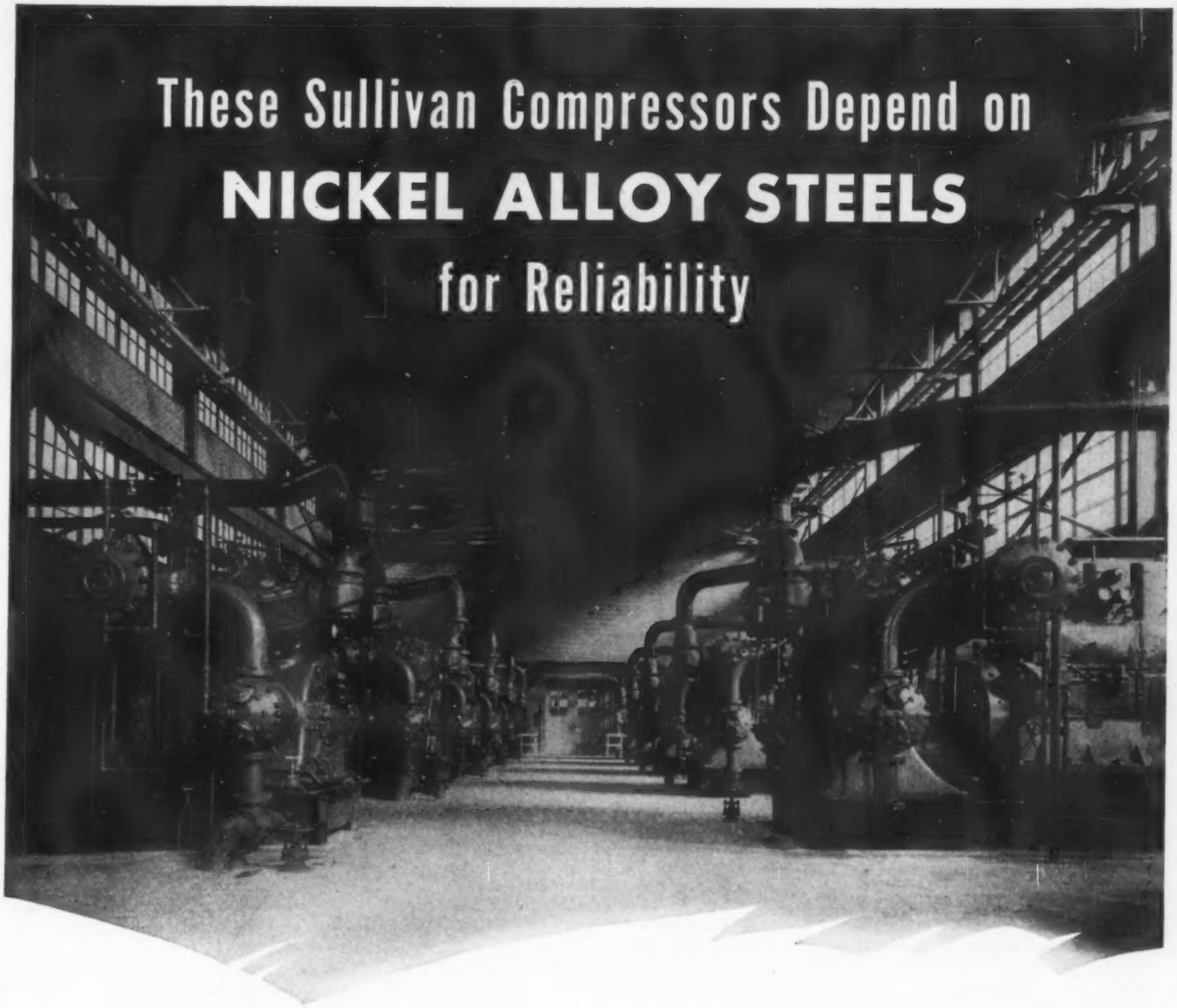
Pierre C. Perrine
Richmond, Ind.

•

The importance of this subject should be firmly impressed on the mind of every supervisor in industry, because only too ofter supervisors consider man as a machine, or a group of machines, rather than as individuals with different thoughts and abilities. In my opinion, it is too bad that industry does not adopt various forms of aptitude tests, similar to those being used in our armed forces and colleges, to try to establish the proper type of work for each employee.

One thing is almost entirely overlooked—the employee's personal life. Often an employee's home life or personal habits are reflected in his work. This may be the trouble in this case. To cite an example, a man heavily in debt, or in some form of

These Sullivan Compressors Depend on NICKEL ALLOY STEELS for Reliability



These compressors, built by the Sullivan Division of Joy Manufacturing Company, are a good example of the way Nickel alloy steels help make equipment longer-lasting and more dependable.

Crankshafts in these units are of large diameter, and accordingly, a Nickel-chromium-molybdenum steel, Type 4340, is used to secure good depth hardening. This steel makes possible heat treated forgings that provide ample strength, good ductility and ready machinability.

Cross head pins and other stressed parts are produced in a case hardening Nickel-molybdenum steel, Type 4615. This steel responds readily with minimum distortion to simple quenching treatments, and affords a wear resistant, non-spalling surface supported by a tough core that enables the part to resist shocks and overloads.

The excellent mechanical and fabricating properties of Nickel alloy steels provide a practical answer to problems of low-cost, trouble-free operation of equipment.

EMBLEM OF INCO SERVICE

TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes and other alloys containing Nickel. This information and data are yours for the asking. Write for "List A" of publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

YES, you can save up to 20% on a brand new set of Ellstrom Chromium-plated Gage Blocks simply by trading in your worn set under Ellstrom's liberal exchange plan. Here's how it works . . .

(1) If you have a used set of rectangular Ellstrom blocks, you get a 20% trade-in allowance on a brand new duplicate set.

(2) On worn rectangular blocks of any other make, you get a 10% trade-in allowance.

(3) Used sets of square type blocks bring you a 10% trade-in allowance regardless of make.

(4) Or, if you have any number of individual blocks in need of replacement, the same discounts will be allowed on the price of replacement.

NOTE: All discounts are based on existing W prices.

Under this liberal exchange plan, you can keep your old blocks until we deliver your new ones—each having the inimitable Ellstrom feature of Chromium plated gaging surfaces to assure you of longer wearing millionths!

Write today for latest Ellstrom prices and delivery schedules.

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

Chromium plated gage blocks

now available

in sizes as low as .020 of an inch

legal entanglement, might easily work his mind up to a state where he will feel everything is wrong, not only at home, but at the shop as well, causing discomfort to everyone concerned. This might easily be corrected by a careful analysis of the case.

L. C. Vinger
Waukesha, Wis.

"Quotes"

Handling Problems

SPEAKING AT the Materials-Handling Conference in Cleveland, R. W. Mallick, Section Engineer, Headquarters Manufacturing Engineering Department, Westinghouse Electric Corp., claimed indisputably that materials handling, as applied to effective use of labor, is a management responsibility. He said:

"Handling seems to be the problem of the day. President Truman has his troubles handling Congress. Management and labor have not yet found a common ground for handling each other. And most of us have not yet learned, or we have not been able to sell to those who have authority, how to handle materials effectively and economically.

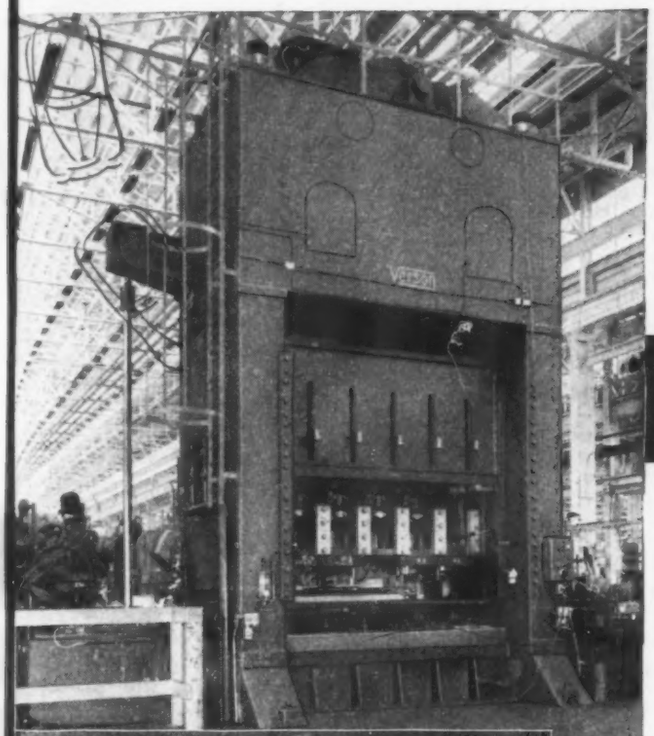
"Let's face the issue squarely. About 15 years ago, we paid for common labor, usually employed for materials handling, from $0.35 to $0.55 per hour.

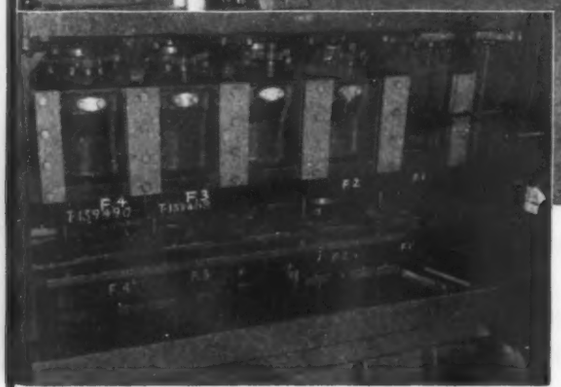
"Today, among the leading electrical-apparatus manufacturers, the hiring rate for the lowest grade of labor is in excess of $1.00 per hour. This amount is augmented by incentives and bonuses. Add to this the welfare items which your payrolls carry and you have a rather tidy rate for each hour of unproductive labor.

"Under ordinary conditions, labor sells you 8 hours of effort for 8 hours of pay. The productive results of that effort depends to a great extent on how much mechanical advantage management applies to that effort.

"A $1.15 per hour laborer will spend that hour lifting and piling boxes within the limits of his physical capacity, or he will lift and pile many times more boxes if management has provided him with a mechanical assistant to help him pile. In nearly every ordinary case where mechanical equipment can be used to augment human labor in mate-

A Real Producer





e-up showing progressive stages of this manufacturing operation

Completed brake drum disks being discharged from the press

- 5 operations simultaneously on brake drum disks!
- 5 individual slides!
- 1200 tons total capacity with one station having 700 tons capacity!
- 120 inches between housings!
- Weight over 500,000 pounds!

this Verson press

. . . is speeding the production of vitally needed automobiles

With the Verson Transfer Feed Press illustrated above five operations are performed automatically in a single press. Stock is fed into the right-hand side of the press and completely formed brake drum disks are discharged at the left. Already applicable to the manufacture of coaster wagons, cooking utensils, refrigerator dehydrator pans, stove parts and many other concentric or symmetrical pieces, this method of manufacture is rapidly spreading to other fields of mass production.

VERSON ALLSTEEL PRESS CO.

9316 So. Kenwood Ave. • Chicago 19, Ill.

Originators and Pioneer Builders of Allsteel Welded Presses

While in Chicago for the Machine Tool Builders' Show, you are cordially invited to visit the Verson plant. Visitors will be conducted on a tour of our modern manufacturing facilities and have the opportunity to inspect representative Verson presses in operation.

ER PRESSES ★ CLUTCHES ★ FORGING PRESSES ★ DIE CUSHIONS ★ HYDRAULIC PRESSES ★ PRESS BRAKES

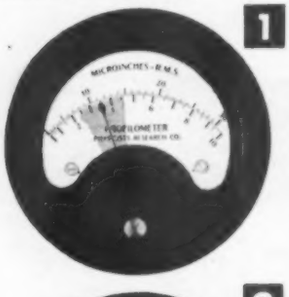
How to catch **DIMENSIONAL ERRORS**

BEFORE THEY OCCUR...

With Tremendous Savings in Time and Cost

This new technique of quality control offers tremendous savings wherever parts are produced in quantity by machining operations—for it gives positive warning of dimensional changes ***before they take place!***

Change in surface roughness is the clue, since it directly indicates the dulling of cutting tools or grinding wheels which results in dimensional errors. The ***start*** of defective cutting action is shown by an ***increase in surface roughness,*** and is quickly determined as follows:



1 Take Profilometer readings of finished pieces, and note the roughness readings along the length of the work area. These readings are made ***right on the production line,*** or even in the machine—and ***without cooling the work*** as required for precision gaging.

2 When the ***range*** of roughness starts to increase (as shown directly on the meter dial in microinches), you know that the tool or grinding wheel is starting to become dull, and that dimensional errors will soon follow because of defective cutting action.

3 Shortly thereafter, when the ***average*** roughness begins to increase, as well as the range, you know that the work will no longer be within required dimensional limits.

This simple procedure enables you to ***prevent*** errors ***before they occur*** —and it can be applied to practically any surface that can be produced by normal machining methods. The initial cost of the Profilometer is soon repaid by resulting savings in production time and elimination of rejects.

May we send you descriptive literature?

The PROFILOMETER
TRADE NAME REGISTERED

PHYSICISTS RESEARCH COMPANY

ANN ARBOR • MICHIGAN

rials handling, the cost rate per hour for the equipment is only a fraction of the cost rate per hour of labor, yet the total work performed is many times more in units of work as compared to using human labor alone.

"This simple truth still lacks appreciation on the part of many managements. Too many of our old-line managers have not recognized the fact that there is no more cheap labor today.

"In his recent address to Congress, President Truman admonished management to reduce prices. With labor and materials at the highest levels in history, and with prospects of going higher, there appears to be only one answer—more effective use of these elements. The most fertile field in all industry is in materials handling.

"Management must soon recognize this fact, and apply more engineering effort to this field. Plant layouts and materials-handling systems must be engineered—not accumulated."

•

To Organize Materials Handling

JOHN J. SHEAHAN of Drake, Startzman, Sheahan, Barclay, Inc., speaking at the April Production Conference (New York), American Management Association, called for giving the man in charge of materials handling a place in the top counsels of management. To bring the handling of materials in production up to the standard of production itself, he recommends five key steps:

1. "Organize your physical distribution functions so they head up to one man. Make sure that he has not only the responsibility, but also the authority. Place him on a sufficiently high level in the corporation so he can participate in top management counsels and get a hearing for this point of view when basic decisions are to be taken.

2. "Apply the same standards of technical qualifications to key personnel in the physical distribution department as are applied to the production or sales departments. In other words, bring it out of the back corner of the plant, not only physically but also in mental attitude.

3. "Pursue a policy of constant research. Make time and motion studies on materials handling. set up job descriptions and job evaluations and establish production standards as intelligently here as elsewhere in the plant.

4. "Make sure that complete liaison is established between the physical

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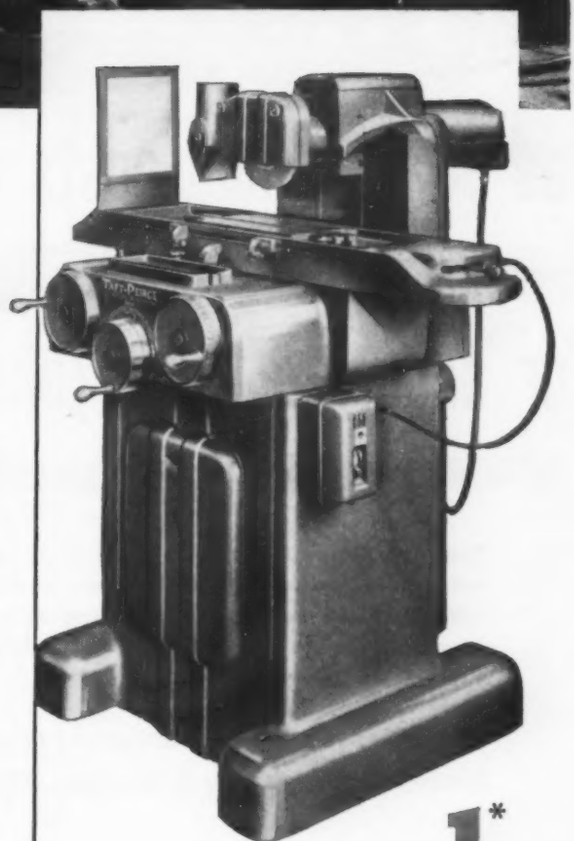

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distribution department and all other departments concerned. Production control cannot be efficient unless all production components are where they are needed, when they are needed and in the quantity needed. This is a function of materials handling.

5. "Select equipment suited to the job. A thorough study of all operations is first required. Find out exactly what equipment is needed and standardize on that. The nature of your facilities, floor load capacities, ceiling heights, volume of material to be handled, intermittent or steady flow, density characteristics, strength of package or piece, all have to be considered. The determination of types of handling equipment is the end product of close and careful analysis."

NEW BOOKS

WORK MEASUREMENT MANUAL—*By Ralph M. Barnes, professor of industrial engineering and director of personnel, College of Engineering, University of Iowa. Published by Wm. C. Brown Co., Dubuque, Iowa. Third edition. 218 pages—8½x11 in. Price $3.75*

Over 5,000 persons from 350 companies have participated in Professor Barnes' work-measurement project during the past two years. These studies have shown: (1) Almost every time-study man can be taught to improve his rating ability, (2) periodic rating clinics are needed in every time-study department and (3) rating of motion pictures is helpful in such investigations although time studies on actual jobs are also valuable.

The manual describes how an organization can check the ability of its time-study men to set standards and to improve the accuracy and consistency of such standards. It tells how to conduct a community time-study survey and gives results of two such surveys, information on development of standard data and results of a recent industrial-engineering survey.

Eighty companies employing from 50 to 15,000 people participated in the latter survey. Some interesting facts disclosed were: Forty-six percent of industrial-eingineering department heads reported to the general manager. Percentage of industrial engineers dropped from 1.5% in companies up to 500 employees to 0.6% in companies from 2,001 to

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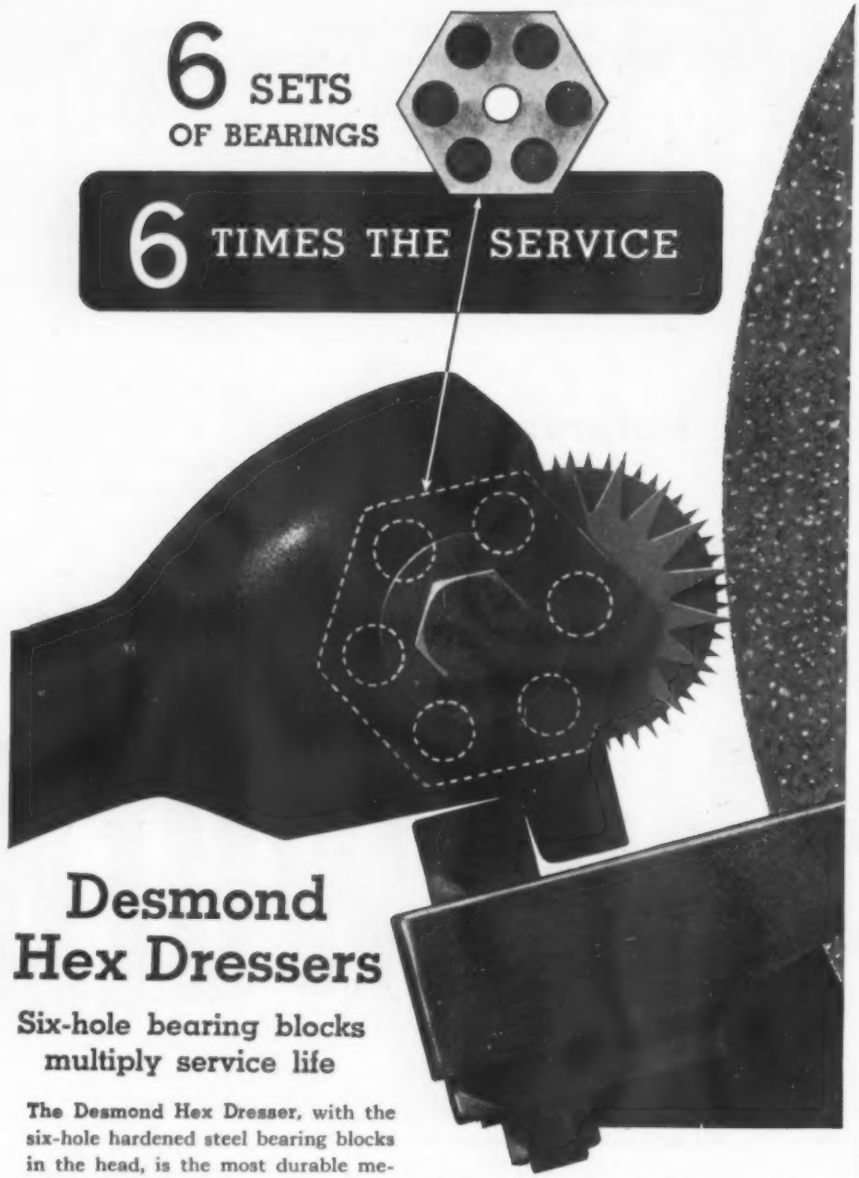

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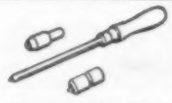

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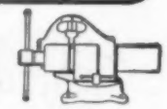

SIMPLEX STEEL-SLIDE VISES

15,000 employees. Standard data for determining time Standards were used in 42% of the small companies (50-500) and 89% of the large companies (2,001-15,000). Eighty-six percent of all companies paid some or all their hourly factory employees on an incentive basis, with 33% using the 100% premium plan as compared to 31% using straight piecework.

•

THE WELDING ENCYCLOPEDIA—*Twelfth edition. Re-edited by T. B. Jefferson, Editor, The Welding Engineer. Published by McGraw-Hill Publishing Company, 330 West 42nd St., New York 18, N. Y. 1024 pages. Price $6.50.*

Every subject which deals in any way with welding, cutting or related processes is covered thoroughly in this edition. Since the first edition came out in 1921, the Encyclopedia has been revised twelve times. However, this has been the most drastic revision to date, over 300 pages being replaced because of the progress made in welding during World War II. Over 175,000 copies have been sold and placed in libraries, trade schools, colleges and industry since 1921.

The major part of the edition, 800 pages in length, is a concise encyclopedia of welding. Many of the alterations and additions have been suggested by readers of previous editions. Suggestions for additions were also obtained from information inquiries of students, welders, supervisors and engineers. As a result data on metallurgy, metals, underwater welding, underwater cutting, weld inspection methods and various processes have been expanded. Also included are data on structural welding and the latest welding codes; boiler welding and boiler-welding codes and general additional coverage on design, construction, production and maintenance.

This first part is followed by an appendix of 32 pages, which includes specifications tables and charts, examples of good and bad welds, temperature conversion tables and an electrode conversion chart which lists various welding electrodes by tradenames and comparable AWS designations.

A dictionary of tradenames applying to the welding industry is included in the third part. In addition to the tradename, the product to which it applies and the manufacturer are listed. A buyers manual provides a key to the sources of equipment useful and necessary to the welding field.

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THE BLUEPRINT LANGUAGE—*By Henry Cecil Spencer, professor of technical drawing, Illinois Institute of Technology, and Hiram E. Grant, professor of engineering drawing, Washington University. Published by The MacMillan Co., 60 Fifth Ave., New York, N. Y. 255 pages. price $5.00.*

Written for the purpose of teaching the student to make and read commercial blueprints, this book contains no hypothetical illustrations. Each of the drawings or parts of drawings is taken from an actual commercial blueprint.

Perforated exercise sheets are included in the book which can be removed and used by the student. An introductory chapter discusses the methods of blueprinting and gives suggestions for studying the subject.

After instruction in the general principles of views, the book covers the various methods of representing units encountered in mechanical drawings, such as threads, gears and welds. One chapter discusses shop processes and their influence on the blueprints.

•

KNUDSEN: A BIOGRAPHY—*By Norman Beasley. 397 pages, 6x9 in. Published by Whittlesey House, Mcgraw-Hill Book Co., 330 West 42d St., New York 18, N. Y. Price $3.75.*

When President Roosevelt asked Bernard M. Baruch to name America's three top production men for the Council of National Defense he was preparing to set up, Baruch replied: "First, Knudson; second, Knudsen; third, Knudsen." Christened Signius Wilhelm Poul Knudsen in Copenhagen 68 years ago, the subject of this recommendation came to this country 47 years ago. He rose to production chief at Ford, switched to Chevrolet, became president of GM, and guided our big production jobs of World War II.

Knudsen started as a janitor here, but his employer found him a shipyard job within a week. There he learned to be tough, even entered some amateur bouts. He shifted to the Erie locomotive shops, but moved on—for less money—to a bicycle factory when he found promotion too slow. The bicycle plant began making parts for Ford, then was bought by Ford with the stipulation that Knudsen, among others, went along.

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highly readable anecdotes to round out the facts. This competent biographer goes on to explain just what happened to OPM—the political maneuvering that Knudsen would not believe could go on in the midst of war. The book ends, appropriately, with a chapter of quotations from Knudsen—the man who did his job, come Hell or high water.

•

SIX-PLACE TABLES (Seventh Edition) —*With notes by Edward S. Allen, prof. of mathematics, Iowa State College. 232 pages, 4½x7 in. Flexible covers. Published by the McGraw-Hill Book Co., 330 West 42d St. New York 18, N. Y. Price $2.50.*

Tables of squares, cubes, square and cube roots, fifth roots and powers, circumferences and areas of circles, common logarithms of numbers and of the trigonometric functions, natural logarithms, exponential and hyperbolic functions, and integrals comprise the books. Additions in the current edition are tables of natural logs, exponential and hyperbolic functions with six-place accuracy. Also included are powers of *pi* and exponential and hyperbolic functions of multiples of 0.1 *pi*. Fourteen pages of introductory notes explain the tables and the theory of logarithms. A marginal index is provided.

•

60 YEARS WITH MEN AND MACHINES —*By Fred H. Colvin (with D. J. Duffin). 297 pages, 6x9 in. 60 illustrations. Published by Whittlesey House, McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Price $3.50.*

Fred H. Colvin, alias John R. Godfrey, Henry C. Francis, Frank C. Hudson and other pseudonyms too numerous to mention, here puts down his recollections, liberally spiced with anecdotes. The great and near great of Metalworking parade through them, natural to the life as seen through a pair of most observant eyes of the last half century.

Fred has lived through the six decades of America's greatest development, starting in 1883 with a 60-hr. week at 5 cents an hour when he was 15, and now at 79 is a consultant at Oak Ridge, Tenn., "on certain details of the atomic power project." As early as 1886 his first contribution to *American Machinist* was published. It led to a lifetime association, for he still contributes

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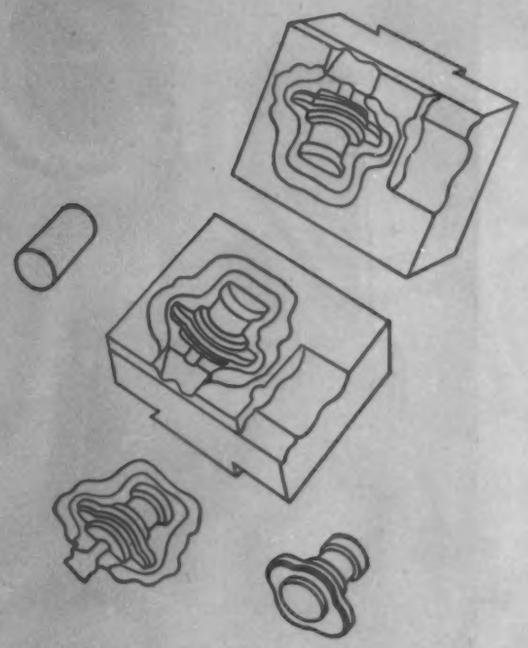

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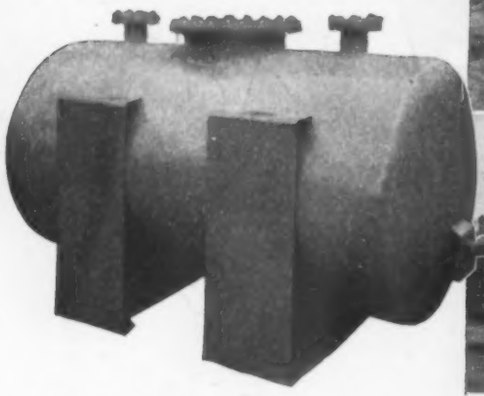

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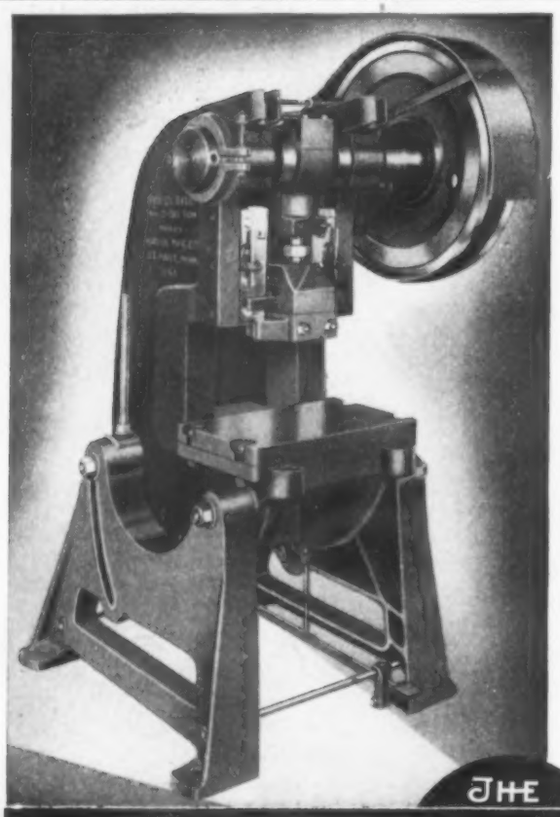

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A REPORT ON STANDARD SAMPLES FOR SPECTROCHEMICAL ANALYSIS—*Published by the American Society for Testing Materials. 1916 Race St., Philadelphia 3, Pa. 28 pages. Price $1.25.*

Quantitative spectrochemical analysis, which is rapidly growing in industrial application, is based on comparison of unknown samples of materials with standard samples of similar composition. For analysis of many common materials, particularly metals and alloys, standard samples have been prepared in quantities adequate for general distribution. In 1943 a report on available standard samples was prepared. The current 1947 report, prepared under the chairmanship of C. H. Corliss of the National Bureau of Standards, extends and replaces information in the earlier report. Extensive tables and tests are given for standard samples of: iron and steel, aluminum and its alloys, zinc, lead, tin alloys, copper alloys, pure metals and salts electrode materials.

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ACCIDENT PREVENTION ADMINISTRATION—*By Frederick G. Lippert. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 159 pages. Price $2.25.*

Plant safety is a management function and the author treats his subject from this viewpoint. He holds that management and its field representatives—the supervisors and foremen—are the only ones in the industrial establishment with the means and authority to control the causes of accidents.

Written as a complete guide to operational techniques in arranging a coordinated program of accident prevention, the book presents steps in collection and evaluation of accident data, training and followup, union participation, and effective inspection methods.

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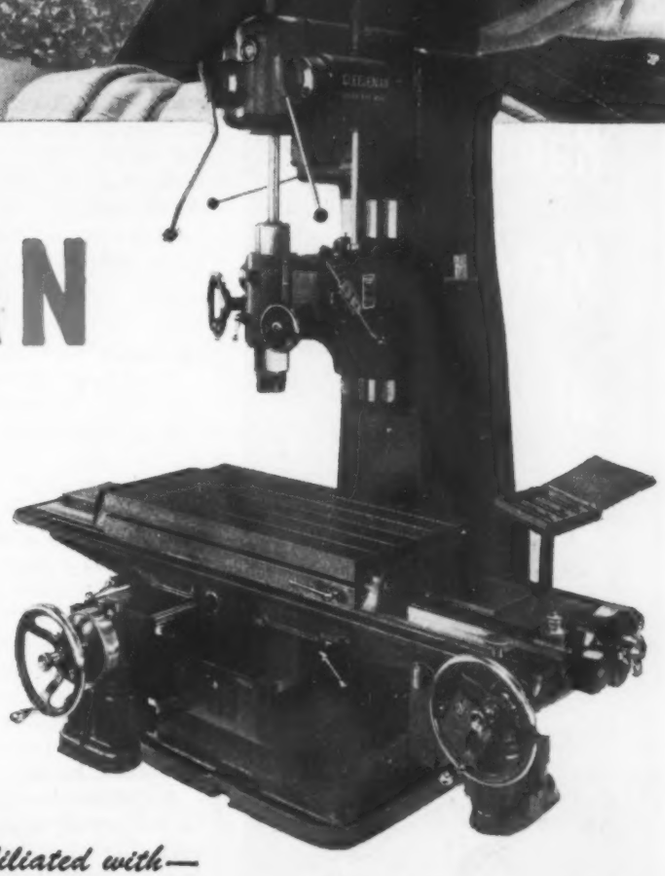

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A TREATISE ON MILLING AND MILLING MACHINES, SECTION TWO—THIRD *Edition. Published by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. 326 pages. Price $1.*

The second of the four parts that will make up the completed treatise covers the milling process, chip formation, surface finish and cutting fluids, power required, and the mounting of milling cutters.

The treatment is thorough and there is a great deal of illustration by drawings, graphs and pictures. All of the pictures illustrate Cincinnati machines but the principles discussed are applicable to milling in general.

Cutting speeds and feeds are discussed in great detail for various types of milling. Formulas are given and clearly explained and tables and nomographs for quick application of the formulas are included.

•

WIRE MEASUREMENT OF GEARS—*Published by The Van Keuren Co., 176 Waltham St., Watertown, Mass. 5 forms. Price $0.05 per form.*

This series of printed forms is for making calculations of measurements over wires for spur and helical gears. They are: VK-101 for standard spur gears, VK-102 for spur gears with enlarged or reduced pinions, VK-103 for standard helical gears, VK-104 for the Zahorski method of measuring standard helical gears, VK-105 for the Zahorski method of measuring enlarged or reduced helical gears.

Each form is available individually or in pads of 25.

•

LEARNING TO WELD—*Published by The Lincoln Electric Co., Cleveland 1, Ohio. 32 pages. Price in USA $0.25, elsewhere $0.35.*

A basic approach for anyone starting to learn arc welding is presented in this booklet. The explanations are simple and a glossary is provided to help the reader who is unfamiliar with the terms.

The booklet describes the clothing and equipment required and deals with such subjects as the method of striking the arc, the welding positions, types of welds, and the procedure for various types.

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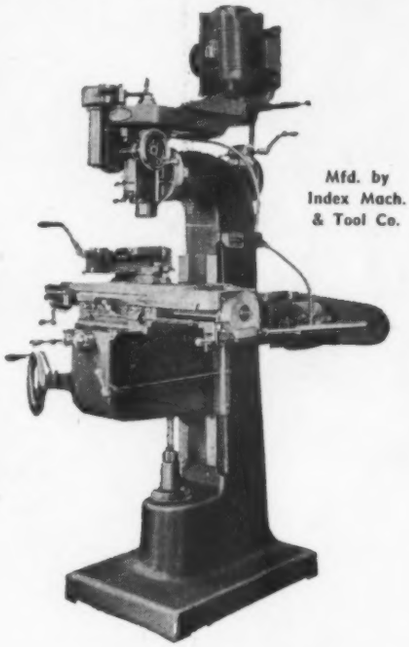

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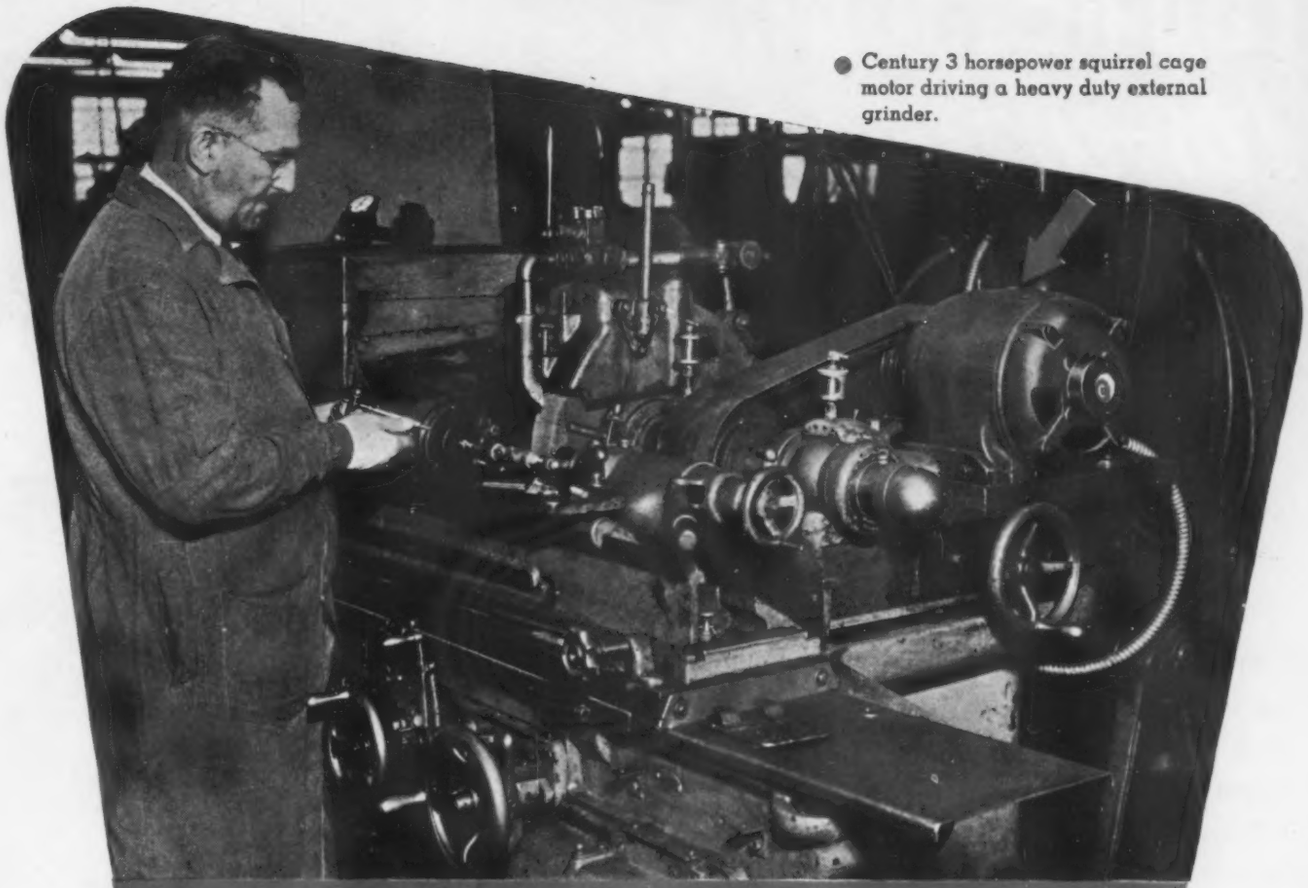
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

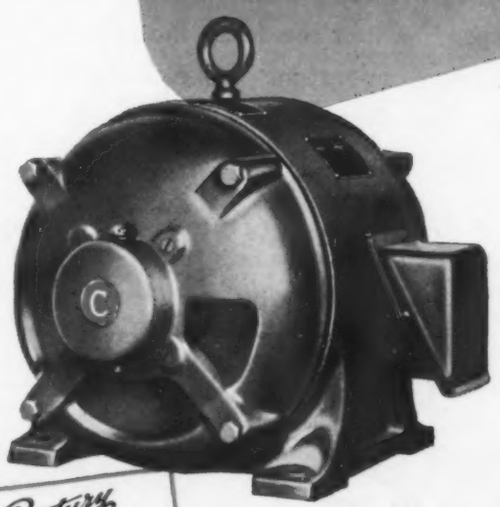
42114



● Century 3 horsepower squirrel cage motor driving a heavy duty external grinder.

Century Motors' *Accurate Balance*

Helps Maintain Machine Tool Accuracy



Accurate mechanical and electrical balance gives Century motors the smooth operation necessary to keep vibration to a minimum — to help maintain all the accuracy built into your machine tools.

The motor frame and end brackets are ruggedly built and accurately machined to form a rigid housing. Mounting feet are accurately machined — bearings are precision finished — scientific cooling system carries off heat — windings are sealed with Century triple insulation. All these features and many more give Century motors the stamina to maintain their freedom from vibration and to withstand the toughest kind of operating conditions.

Century builds a complete line of electric motors and generators, fractional and integral horsepower, in the popular sizes to meet the requirements of industrial production, processing, commercial and home needs. Specify Century motors for all your electric motor power requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY, 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

543

YOU'RE RIGHT! *It's wrong* FOR SPINDLES

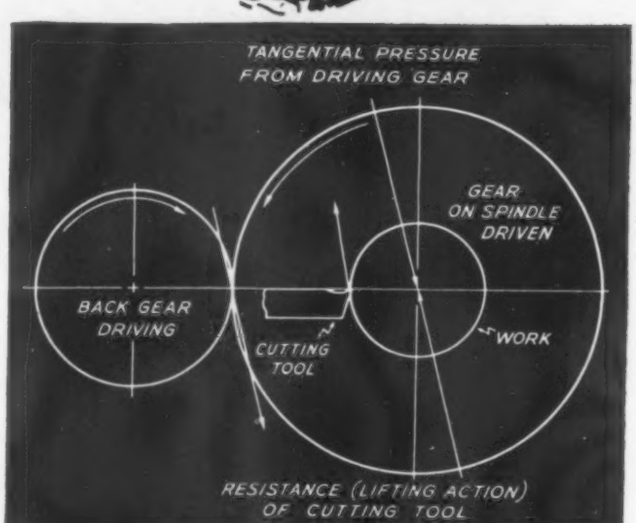
When section hands want to "poosh 'em up" they get a lever on both sides of a rail and "alley oop" she comes.

But pooshing up a lathe spindle with an upthrusting cutting tool at the front and an up thrusting back gear at the back is obviously and eternally wrong as a hailstorm, even if it has been, and still is done on every lathe made in the U. S. except one . . . that one is Boye & Emmes.

Wrong because it promotes spindle whip. Wrong because it promotes chatter. Wrong because it slows down the job. Wrong because it's unnecessary. You can buy a lathe that has the back gear at the front, thrusting down on the spindle, and counteracting the upthrust of the tool, stopping whip and chatter and giving smoother, faster production.

This engine lathe breaks away from tradition, and convention, and embodies engineering imagination in many other improvements equally obvious, and equally well supported by test and experience.

Fortunately, you can buy this lathe right now in all sizes from 14" to 36". You don't have to wait for the September Tool Show to see something



The B & E Lathe is the only one in the U. S. which has the backgear at the front, counteracting the upthrust of the tool.

better than you've been using. But if some lathe should finally catch up with the B & E in respect to putting the back gear in front it might be well to remember that the lathe that pioneered this great improvement and has pioneered so many in the last fifty years will pioneer the next sensation.

Does B & E think it's pretty good? Is it worth your while to learn more about this lathe of surpassing craftsmanship? Definitely. Write for booklet #50 . . . see how engineering skill and experience combine to produce this great improvement in lathe design.

BOYE & EMMES

BEGINNING TO END

125 CALDWELL DRIVE · CINCINNATI 15, OHIO · U. S. A

MEET YOUR LONG DRILL REQUIREMENTS WITH ACE DRILL'S 12" LONGBOY

The popular Longboy is an economical substitute for "specials" generally required for deep hole drilling. Like all Ace Drills the 12-inch Longboy is ground from solid pre-hardened bars of high speed steel. It's a drill that remains true and straight because it is fluted after hardening. Pre-hardening, then centerless grinding, eliminates distortion. Grinding the flutes into the solid bar produces a web that is concentric with its periphery. The grooves are symmetrical and the cutting lips are identical. The 12-inch Longboys cut to size even after repeated sharpenings.

The flutes are of regular construction and are highly polished for smooth chip flow.

The Longboy is a general purpose* drill that is very useful in a wide variety of deep hole jobs. The Longboy can frequently be used economically instead of special 8" or 10" drills. The unit price is the same for any quantity and is often less than the price of special, shorter drills—and delivery is from stock.

delivered from stock

IN 25 SIZES

1/8" to 1/2"

* *It should not be used to drill the harder alloy steels and forgings. (A special, heavy web crankshaft-type drill is recommended for these applications. Information and prices on request.)*

2255

ACE DRILL CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

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AMERICAN AUTOMOBILE . . . 1947 MODEL
4,505 pounds
150 horsepower
TRANSPORTATION FOR POST-WAR FRANCE
496 pounds
6.6 horsepower

There's metalworking news everywhere . . .

FIRST POSTWAR LOCOMOTIVE TO ROLL FROM THE RECONSTRUCTED SKODA WORKS

IN 1945 SKODA LOOKED LIKE THIS

WHEN COAL CAME BACK, THESE ENGLISH TRUCKS BEGAN TO MOVE AGAIN

BRIGHT SPOT AMIDST ITALY'S ECONOMIC CHAOS: THE NEW CERUTI LATHE

...THE BIG ONE but don't you want to know about the little one?

Our biggest American industry, Metalworking is also Europe's biggest.

On every European front American Machinist is gathering in the facts.

Building the diverse products which represent over one-third of America's industrial output keeps Metalworking's production executives busy. And making sure these products are the world's best is an exacting task. But this very insistence on quality and constant improvement is the reason why these clear-thinking men want to know about everything . . . from everywhere . . . which can make their products better.

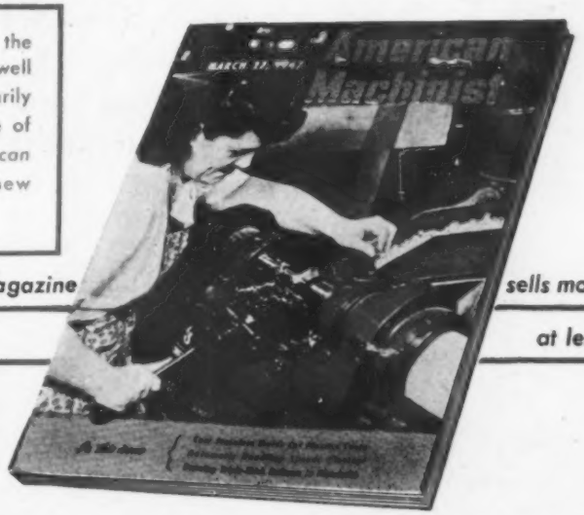
In *American Machinist* these metalworking facts from "everywhere" take concrete shape every other week. Interestingly told, soundly analyzed, clearly illustrated . . . outstanding foreign news coverage is one additional reason why more metalworking executives read *American Machinist* than any other metalworking magazine.*

Another reason they study *American Machinist* is to find out about the products of people like you. Almost 1,000 advertisers are using this magazine's pages to tell Metalworking's men-of-decision about the things they make. And *American Machinist* readers have proved they want these facts from *you* . . . if you make anything which can cut their costs . . . speed production . . . improve product quality.

Your *American Machinist* representative can give you all the reasons why advertisers entrust to this magazine their largest investment in advertising to Metalworking. See him soon.

***Net paid circulation now over 28,000, including 3,000 foreign subscribers**

This message, one of a series now appearing in the advertising press, we think will interest you as well as the advertising executives to whom it is primarily addressed. It points up the world-wide coverage of Metalworking which helps you and other *American Machinist* readers to keep informed about new production developments.



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ABC • ABP

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Trouble-free Operation

PRODUCTO

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When Producto Die Sets leave any one of our NEAR-NEIGHBOR Service and Assembly plants, they're as Right as highly skilled machinists can make them. We have set a high standard of inspection rules and they are rigidly maintained . . . to give you exactly what you specified. Pin lengths must be as ordered, bushings in the type you want, shank diameter correct, working surfaces within proper tolerances and guide pins absolutely aligned.

The result of this care is reflected in quick, easy set up . . . minimum production down-time . . . a long service life.

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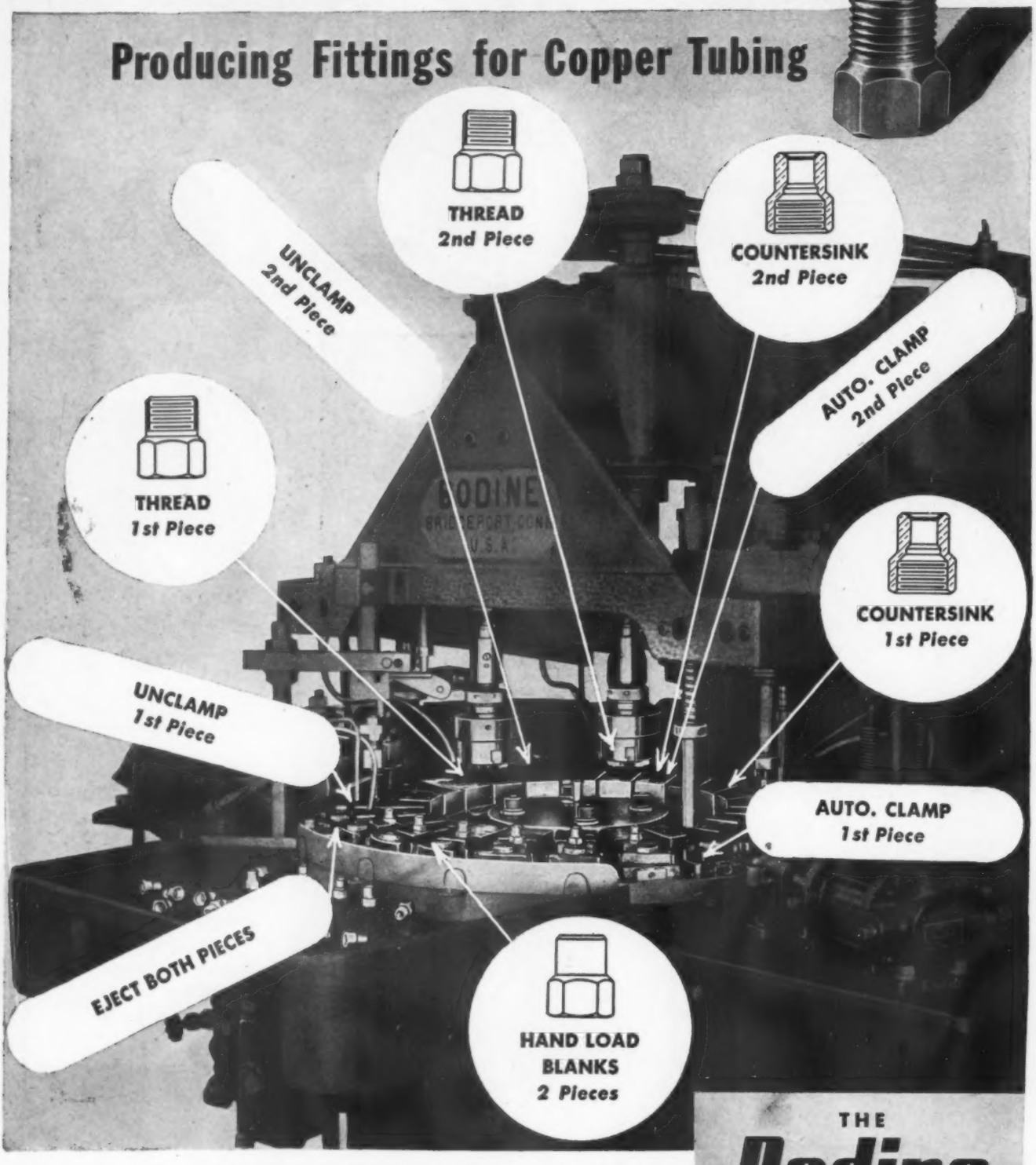
CLEVELAND, OHIO

Bodine ..Case History No. 21

Producing Fittings for Copper Tubing



Blanks produced on Screw Machines (or Bodines) from forgings or castings. This No. 42-30 machine produces secondary operations as indicated. Sizes to ¾" pipe . . . 2500 to 3000 per hour, dependent on size and material.

See Bodine Machines under power at National Machine Tool Show, Chicago, Sept. 17-26. Booth 633.

THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

N • B • M BEARINGS
BETTER BEARINGS

N•B•M GRIDDED BEARINGS GIVE TRIPLE "BURN-OUT" PROTECTION

This is an enlarged cross-section of an N-B-M Gridded Bearing for Diesel engine and other high-speed, heavy-duty service. See how the 3 interlocked "layers" guard against bearing failure:

1. *.002" lead-tin alloy "run-in" surface,* electroplated in bore, increases resistance to seizure and corrosion.
2. *Precision-spaced grids* filled with N-B-M Silver Babbitt for: (a) "self-healing"—in case of overstress, melted babbitt flows over damaged area, restores bearing surface; (b) instant embedability—grit is safely trapped below surface.
3. *Centrifugally-cast lead-bronze shell* for: Greater strength, fatigue resistance • High thermal conductivity to equalize temperature • Conformability.

May we send complete engineering data?

NBM

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION
ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

QUALITY is a tradition at Circular Tool and because it is, CIRCLE R HIGH SPEED METAL SLITTING SAWS, along with all CIRCLE R Metal Cutting Tools, are an unqualified success in whatever job they get their teeth into!

The finest materials available, the highest type of craftsmanship possible, these are the key factors that make CIRCLE R METAL CUTTING TOOLS coast-to-coast favorites in many industries.

Name your cutting or slitting problem. CIRCLE R has a tool for the job!

CIRCLE R Metal Slitting Saws are available in diameters from 1¼" to 10".

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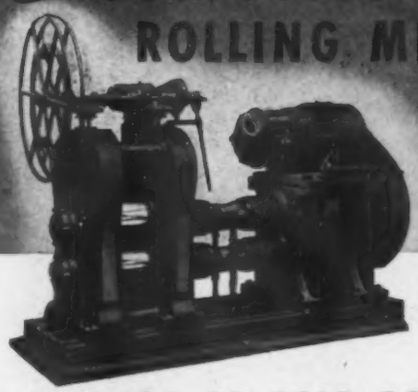

FOR HOT OR COLD ROLLING OF STRIP, ROD AND INGOT

Speeds are provided for rolling metals in any range to 1000 feet per minute and tandem mill stands are designed with constant torque to synchronize stock between stations. Two, three, or four high Mills have roll sizes from 1½" diameter and 1" face to 16½" diameter and 18" face. Special units are also available for grading, cross and pinch rolling, forming wire to exact dimensions and for various shaping operations. Write for Catalog RM.

STANDARD MACHINERY CO.

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MANUFACTURERS OF Power Presses to 500 Tons Rolling Mills • Swagers • Turks Heads • Steel Die Sets

Versatile TOWNSEND RIVETERS

Perform EVERY Riveting Operation

No matter how rugged the work you perform... or how delicate... there is a Townsend machine ideally suited to your assembly requirements. Rivets, studs and fasteners in a wide range of lengths and diameters can be efficiently handled by the same machine. Because the intensity of the blow is controllable, parts may be assembled loosely enough to pivot, or tightly enough to prevent any relative motion.

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In the production of various frames, bases, housings, etc., such as the unit illustrated above, where quantity production is not anticipated, welded steel is the solution . . . it saves time, reduces cost, and gives you greater strength with less weight. The Steel-Weld Division of The R. C. Mahon Company stands ready to meet your requirements regardless of size, weight, shape or construction . . . thoroughly experienced Mahon design engineers and highly skilled workmen are your assurance of a better job, and a finer appearing job embodying all of the inherent advantages of Steel-Weld Fabrication.

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THE R. C. MAHON COMPANY

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Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

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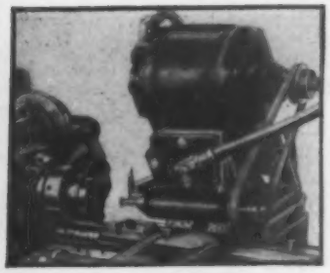
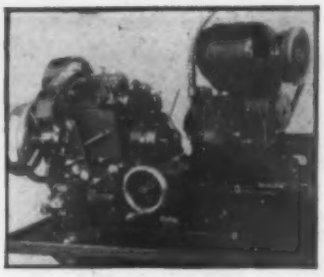


Machine equipped with Internal Milling Attachment



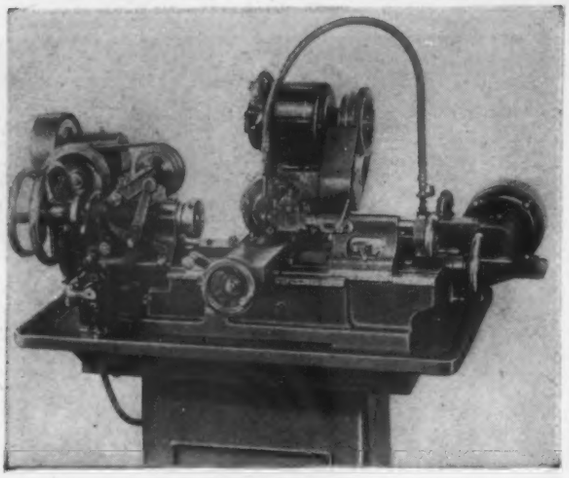
Machine equipped with Relieving Head

ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.



Special Equipment Extends Utility

Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

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HAVE YOU AN INTRICATE TOOL DESIGNING PROBLEM

If you have such a problem, why not submit it to a Company with a background of years of experience. No problem is too complicated or intricate, and we know that the ingenuity and technical skill of our engineering staff, combined with care in building tools, is your guarantee of superior tools.

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BUILDING COMPLETE MACHINE TOOLS
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COLUMBUS DIE·TOOL and Machine Co.

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The Cincinnati

WET ABRASIVE CUT-OFF MACHINE

. . . for straight or angle cutting of practically any material used in general manufacturing . . . including such metals as brass, copper, aluminum, as well as fibrous and plastic materials in various sizes, angles and shapes.

Suitable for making straight or angle cuts in solids up to 2¼" or tubing up to 3½" diameter. Same vise is suitable for various cuts. Maximum capacity is 2¼" in cutting angles up to 45°. Graduations on table make angle-cutting fast and accurate.

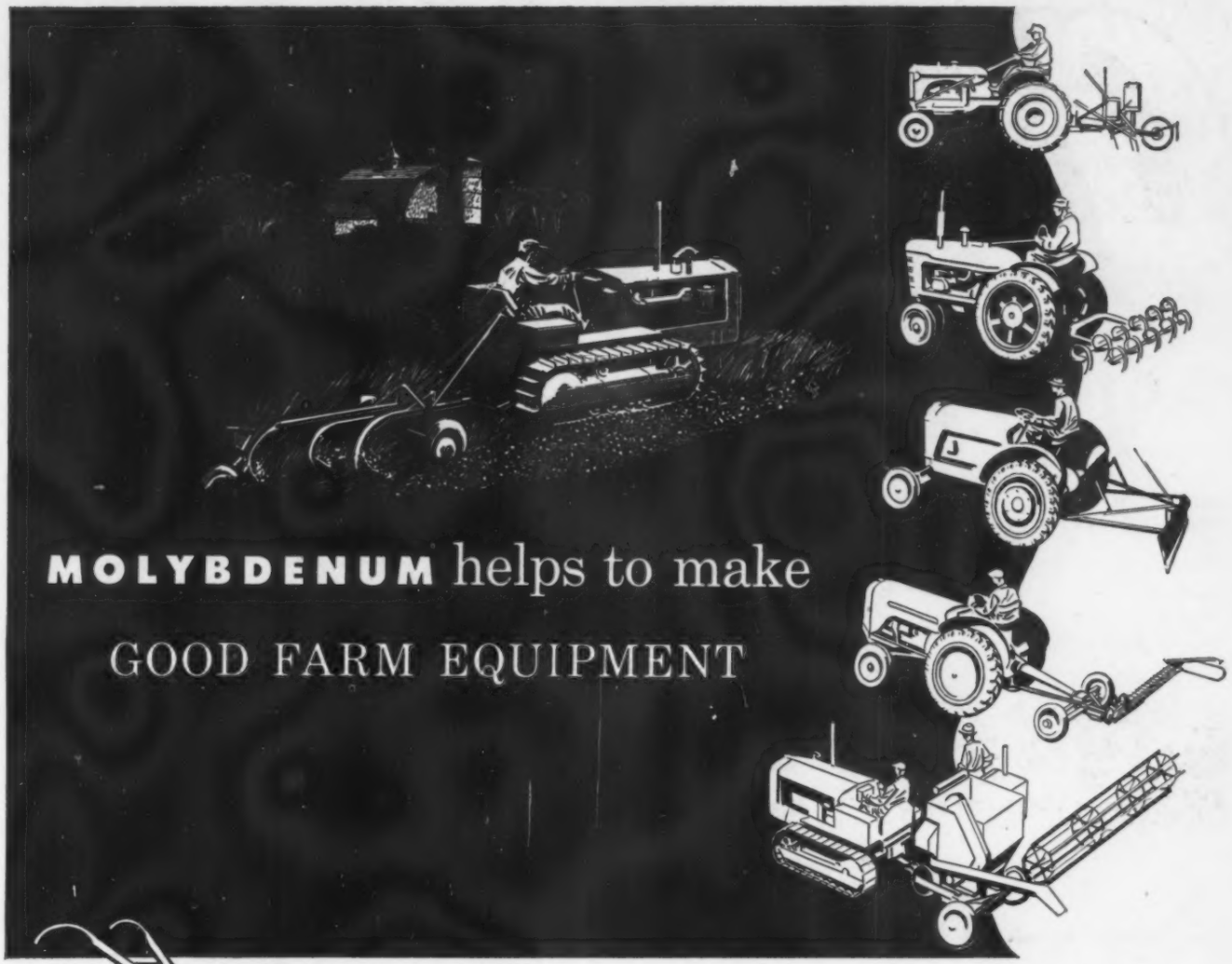
Alternating or direct current.
Write for complete details.

TRADE The Cincinnati MARK

THE CINCINNATI ELECTRICAL TOOL CO.

Division of THE R. K. LeBLOND MACHINE TOOL CO.

2615 Madison Road, Cincinnati 8, Ohio



AGRICULTURAL EQUIPMENT, meeting more and more severe requirements, makes larger and larger use of alloy steels and irons. And among alloying elements none has grown more in post-war favor than Molybdenum.

The reason is easily stated. Molybdenum makes irons and steels more workable for the fabricator and more serviceable for the user.

What is true for agricultural implements is true of other machinery. Potent in effect and therefore economical, adding little to weight, easy for the steelmaker or the foundryman to incorporate in his product, Molybdenum improves machinability, strength—especially high-temperature strength,—rust resistance, corrosion resistance, wear resistance. It is an intensifier, not an inhibitor, of other alloying agents in producing these desirable changes. Among approved applications are those in blades and other cutting parts, punches and dies, gears, crank shafts, piston rings, brake drums, valves, exhaust manifolds, tubing, bolts and rivets, welding rods and coatings.

Inquiries concerning any use of Molybdenum, Tungsten, or Boron will be gladly welcomed by the Molybdenum Corporation.

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MCA

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THE WORLD'S FINEST MULTIPLE SPINDLE

Chucking Machines

GOSS & DE LEEUW MACHINE CO.

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CLEAR VISION OIL GAUGES

Complete range of styles and sizes

In addition to the style "BW" Oil Gauge illustrated, the Gits Line of Gauges provides a complete range, including flush mount and angle types. All styles are illustrated and completely described in the Catalog No. 60—which also presents many and varied types of oilers, seals and lubricating devices. If you have a gauge or lubricating problem, send your specifications for recommendations and prices.

GITS BROS. MFG. CO.

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Exclusive for over 35 years

+ INCREASED PRODUCTION

— REDUCED SETUP TIME

- DAYTON ROGERS DIE CUSHIONS

No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:

1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

Write for illustrated, engineering catalog #100-1

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Manufacturing Company

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1947's Best Bet for Machines and Tools...

Lowest Finishing Costs—Wrinkle finishes are lowest in costs for machines and tools *because*....

1. Little or no surface preparation is required—no expensive machinery—no primer coat.
2. One coat of Wrinkle does the job! Spray or dip—*just* once.
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4. Wrinkle is most durable—doesn't show mars or scratches like smooth finishes.
5. Bakes in only 30 minutes at 325°, in conventional or infrared oven.

Widest Distribution
Wrinkle finishes are available from more than 250 outlets of leading manufacturers of industrial coatings. One or more are near you.

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Mail this coupon *today* for your copy of "Hour Saver—Dollar Maker" . . . it gives complete information on Wrinkle finish applications—illustrated with photos from production.

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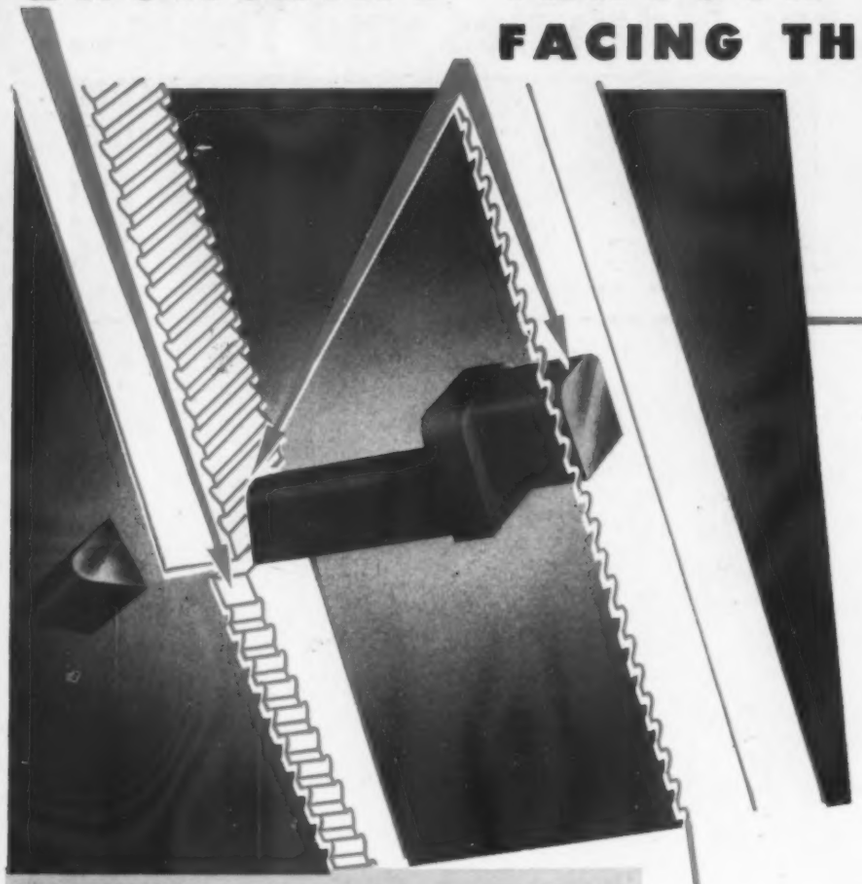
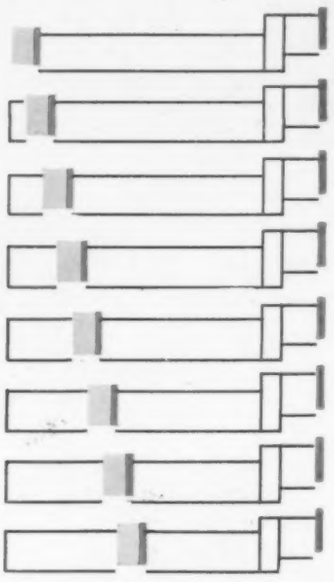
BROACHING THROUGH TO LENGTH— FACING THE ENDS IN *One Stroke*



PART: Turbine Wheel Bucket
MATERIAL: Stainless Steel Forging
MACHINE: Vertical, Single Slide, 10-Ton Broach
LIMITS: ± .001
PRODUCTION: 300% Increase Over Previous Method



And **8 DIFFERENT PART LENGTHS** *broached* **FROM ONE FORGING—** *with one set-up*

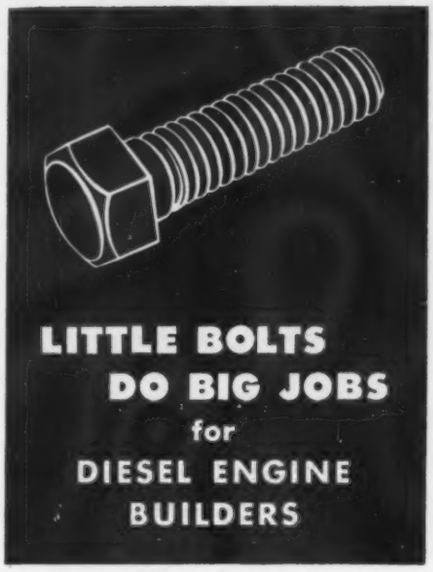
Chances are you don't make steam turbines or turbine wheel buckets. But if you are cutting metal, *and want to do it fast—broach it.*

"300% production increase over previous method." These are typical results when broach tooling, designed and built by Detroit Broach, is put on the job . . . worthwhile results in today's struggle with higher production costs.

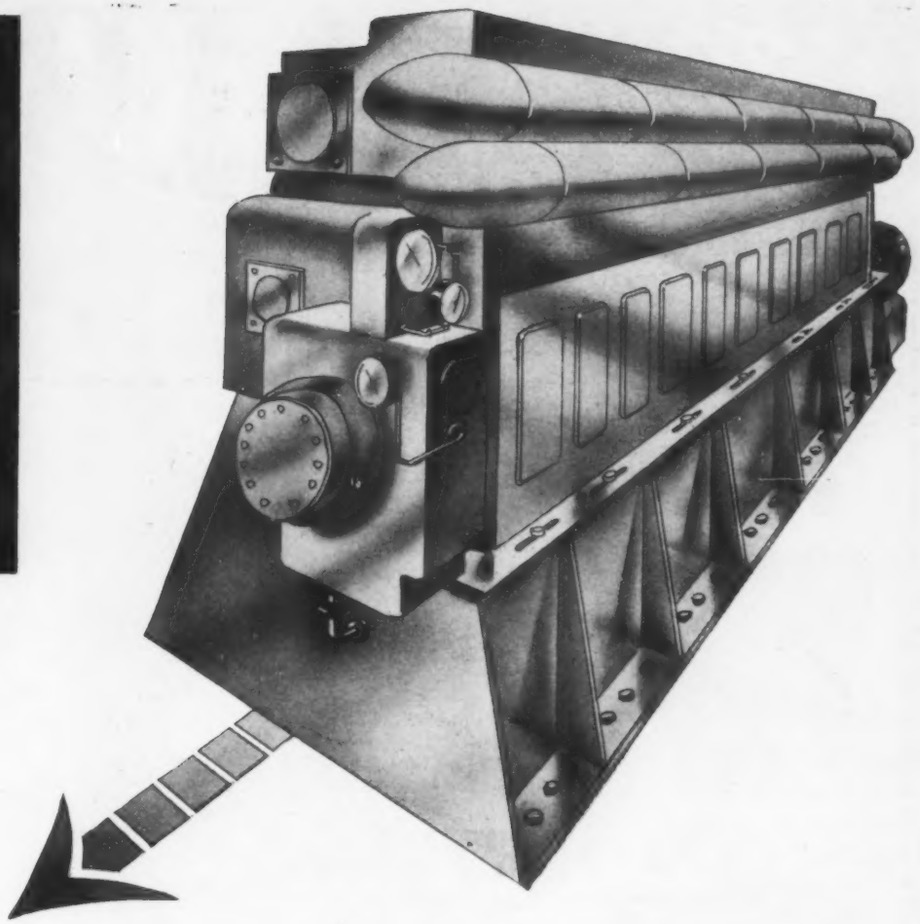
Detroit Broach will gladly consult with you and determine actual cost and production facts on your applications no matter what type of broaching is required. Write today.

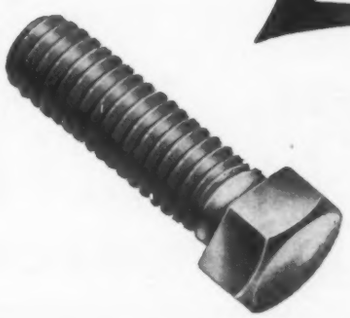
BROACHING TOOL SERVICE **DETROIT *Broach* COMPANY**

20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN



LITTLE BOLTS DO BIG JOBS for DIESEL ENGINE BUILDERS

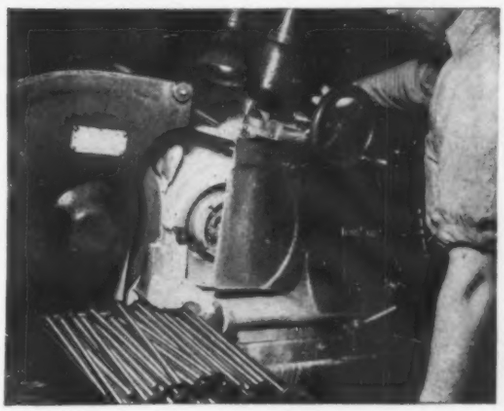




DID YOU KNOW *that the finest precision machine tools are employed in the manufacture of Buffalo Bolts, as in the centerless grinding operation illustrated.*

● The lighter weight of present-day Diesel engines—and their higher speeds, compression ratios and power outputs—calls for the utmost strength and dependability in the fasteners with which they are assembled. That's why Circle B Bolts, such as the cap screw illustrated, are used so extensively by Diesel engine builders...because Circle B Bolts have the built-in strength and stamina to stand up under the most gruelling conditions.

The controlled quality of Circle B Bolts...their uniform size and strength . . . is an asset in the manufacture of any product. It is a benefit you can enjoy merely by selecting Circle B Fasteners for the assembling of your products.



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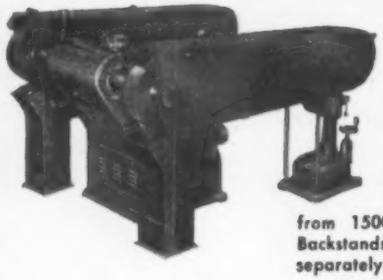

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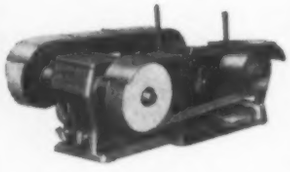

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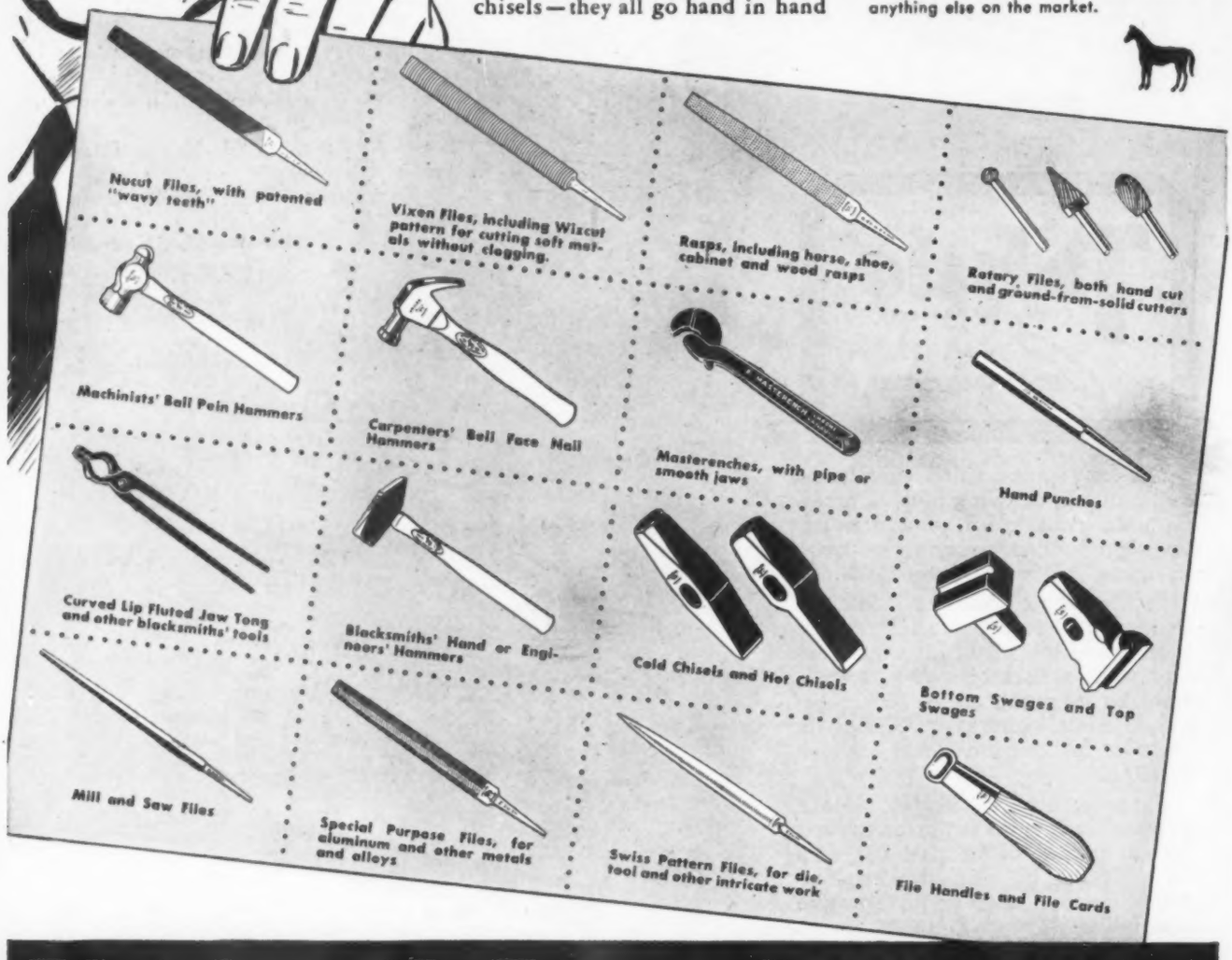
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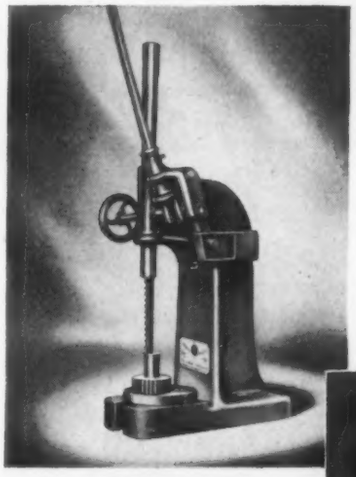

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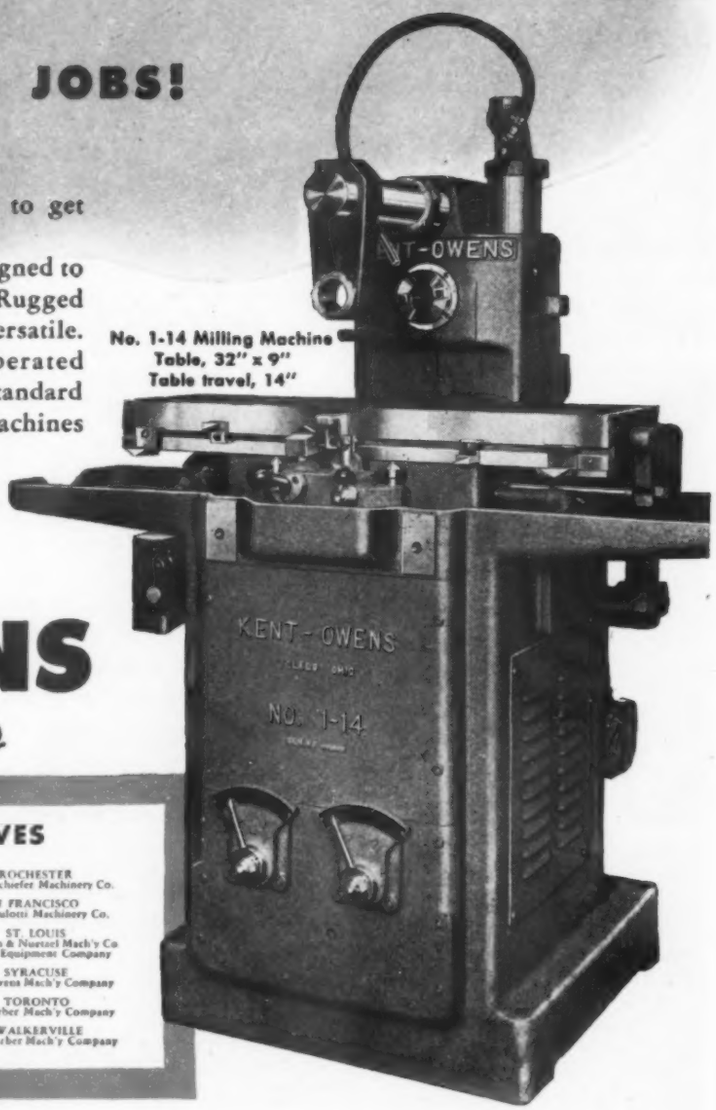

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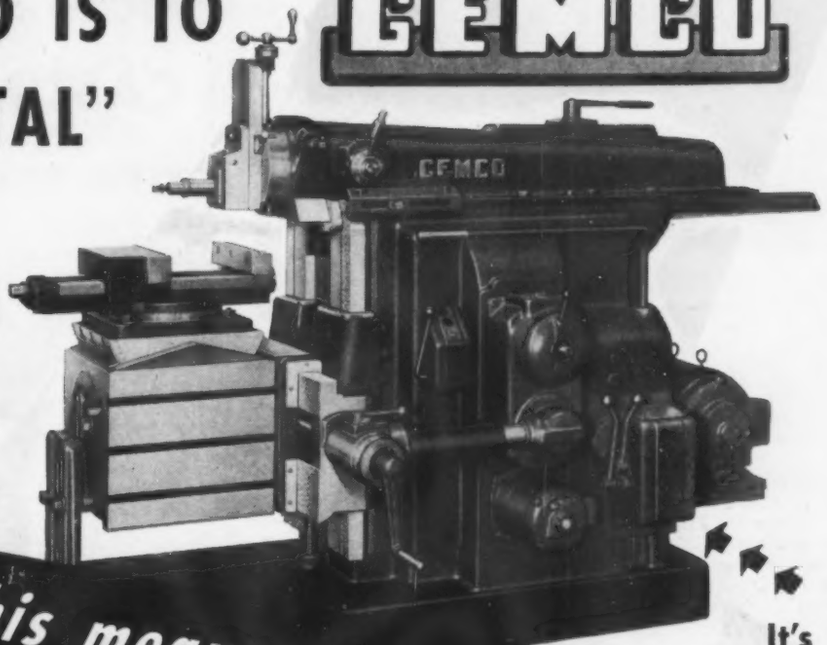

The peculiar adaptability of metal stampings to the important eye-appeal elements in new models, forecasts increased consideration to this type of production — reveals a recent survey.

. . . . this means stampings and stampings mean DIES

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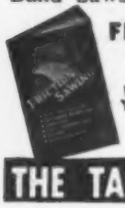

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By OTIS J. BENEDICT, JR.

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CONTENTS

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8. Technological Control
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10. Testing Cast Iron
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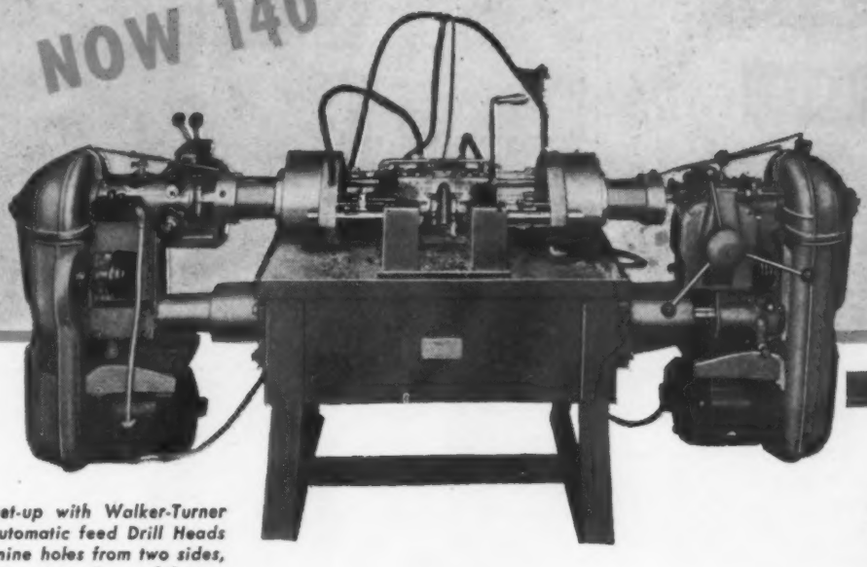
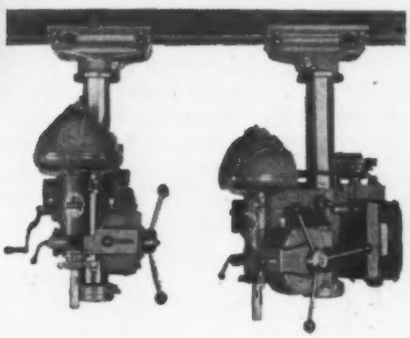


This set-up with Walker-Turner 20" automatic feed Drill Heads drills nine holes from two sides, in one automatic push-button cycle.



Two Walker-Turner standard 20" Power Feed Drill Heads mounted on a sliding carriage supported by an "I" beam. Heads move radially and swing horizontally through a complete circle.

The Du-Fold Mop Manufacturing Company of Cleveland recently increased the production of metal mop heads by nearly 500% by using two Walker-Turner Drill Presses in a special set-up with Zagar gearless drill heads.

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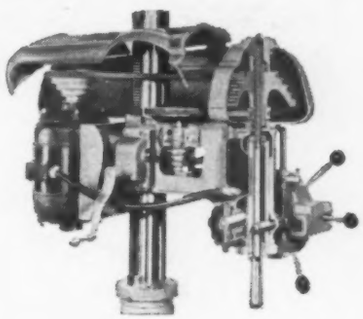

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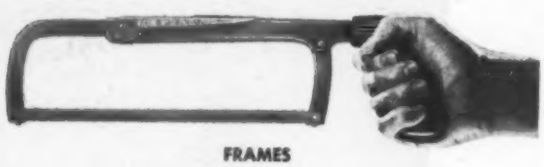

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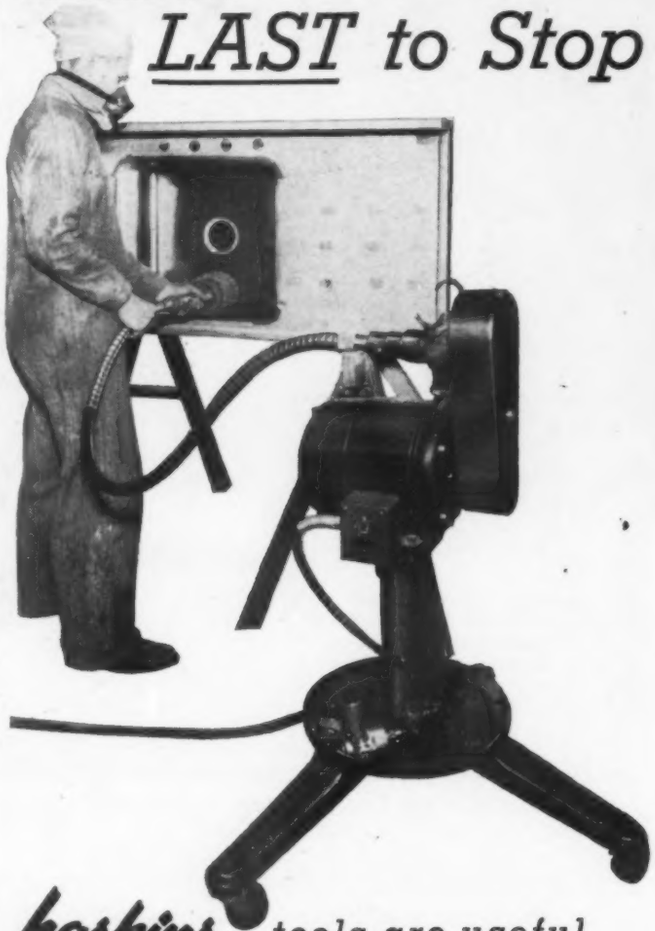

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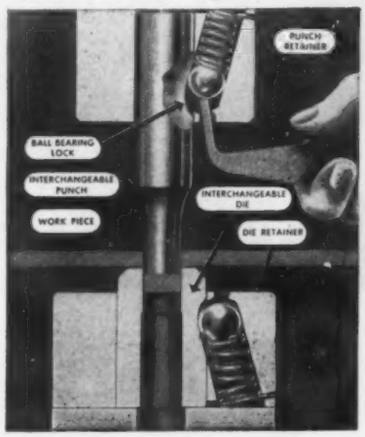

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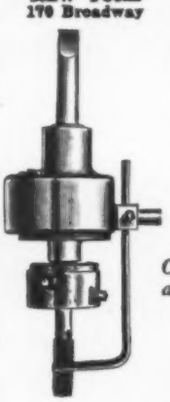
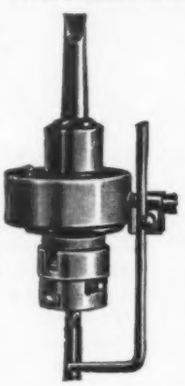
Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" ⅛"
" 0	⅛" ⅛"
" 1	⅛" ¾"
" 2	⅜" 1 "
" 3	⅝" 1¼"
" 4	¾" 1½"
" 5	⅞" 2 "



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

SPECIFICATIONS

Maximum length that can be ground.....13½"
Maximum width that can be ground.....6"
Maximum space under 7" wheel to table.....11½"
Maximum space under 7" wheel to Browne & Sharpe No. 510 Magnetic Chuck†.....8"
Maximum diameter cup wheel with standard guard in place.....3½"
Maximum diameter of wheel.....7"
Required diameter wheel hole..1¼"
Table surface.....5¾" x 13"
Traverse feed, one graduation...001"
Maximum vertical adjustment of wheel by means of micrometer..⅜"
Graduations, vertical adjustment.....0005"

Catalog No. 24-105 — Toolmaker Surface Grinder (for 1425 and 1725 RPM motors) with cast iron legs, wheel adapter, holder for wheel dresser, one V-belt and two-step motor pulley (for 50 or 60-cycle service) with ½" bore. Without wheel, motor, or switch. Shipping weight 670 lbs.....

$354.00

†No. 510 Browne & Sharpe Magnetic Chuck not included as original equipment.

Immediate Delivery...

from your Delta distributor's stock

Now you can get your Delta Toolmaker* Surface Grinder!

You add to the life of your tools, at lower cost — with this husky, big-capacity Delta Toolmaker Surface Grinder. You make a big saving on initial cost, and enjoy ease and speed of operation on surface grinding, tool sharpening, etc.

The Delta Toolmaker Surface Grinder is on your distributor's sales-floor now. Inspect it there, to learn of the many famous Delta Toolmaker operating advantages. They include: Convenient controls . . . Wide micrometer graduations, for close settings . . . Unique wheel adapter that saves time and redressing.

Have your distributor also show you how — with simple attachments — this versatile machine becomes an efficient tool and cutter grinder or a chip-breaker grinder.

Your nearby Delta distributor is listed under "Tools" in the classified section of your telephone directory. See him soon.

DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN
General Sales Office • 6 NORTH MICHIGAN AVENUE, CHICAGO 2, ILLINOIS

*Trade Mark Reg. U.S. Pat Off.

M-23

Your Delta distributor is now showing Delta Cut-Off Machine . . . Delta Super-Hi*-Speed Drill Presses . . . Delta 17" Drill Presses . . . Delta Multiple-Spindle Drill Presses . . . Delta Abrasive Finishing Machines . . . Delta Metal-Cutting Band Saw . . . Delta Toolmaker* Grinders.

✔ You will find that the Oakite CrysCoat Process does more than take a good-sized bite out of precleaning and finishing costs. Paint and similar organic coatings when applied to Crys-Coated surfaces grip uniformly. Finishes hold their fine appearance over long periods.

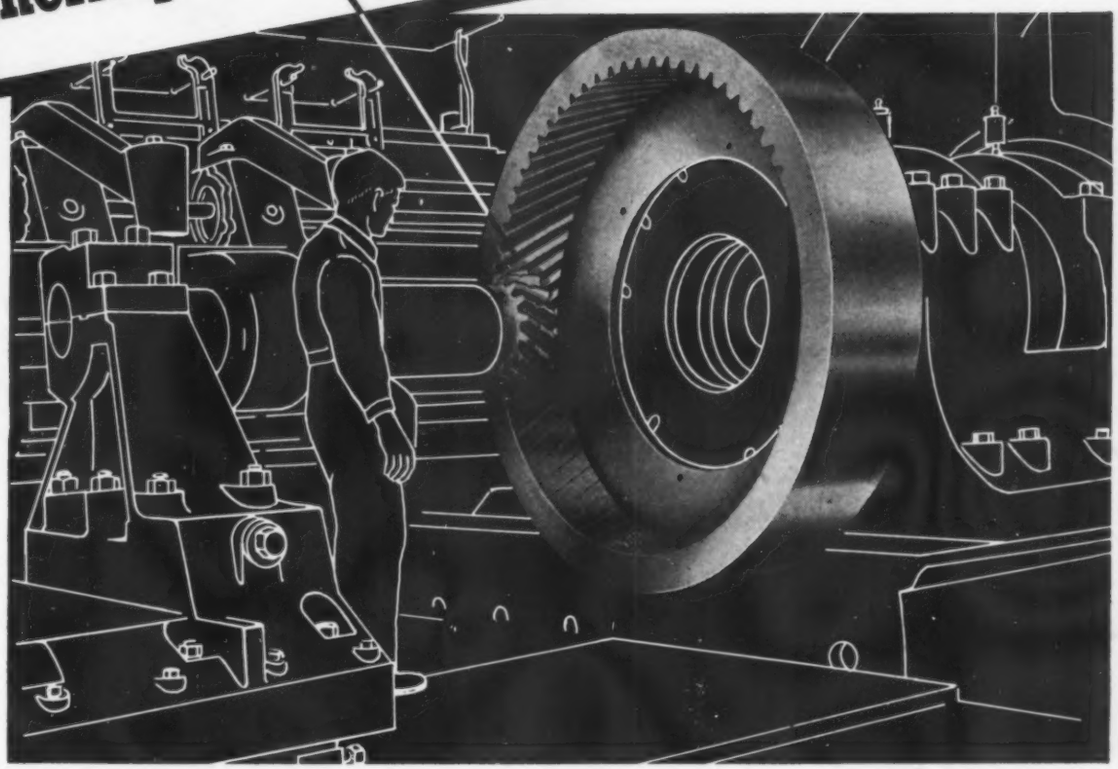
The Oakite CrysCoat Process removes light shop dirt and oils; inhibits rust before parts are painted, localizes it when finished surfaces are damaged in service; and lays down a paint-holding film of microscopic crystalline phosphate. If your set-up includes automatic washing equipment, don't overlook this 3-in-1 technique for maximum paint adhesion and resistance to corrosion. Your nearby Oakite Technical Service Representative will gladly supply you with specific information. Or write direct, on letterhead, for free full details. No obligation.

OAKITE PRODUCTS, INC., 22A Thames St., NEW YORK 6, N. Y.
Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE
REG. U. S. PAT. OFF.

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

Here's where Farrel INTERNAL GEARS inherit precision



The precision in Farrel internal gears is passed on from the machine on which these gears are made — the Farrel-Sykes Gear Generator.

The initial precision built into this Farrel machine plus the inherent accuracy of its operating principle—"precision generation"—gives the gears accurate tooth contour and tooth spacing. Because of this you can be sure that when you buy internal gears from Farrel, they will operate smoothly, quietly and efficiently over a long service life.

Precision generated internal gears with either spur or single helical teeth are available in any size up to approximately 16-feet diameter, 12-inch face, 1¼ DP.

Internal gears frequently meet design and operating conditions better than other types and their availability in large sizes has extended their advantages to many applications where size limitations formerly prevented their use.

Next time you need internal gears or gear engineering help call on Farrel.

FARREL-BIRMINGHAM COMPANY, INC.

344 VULCAN STREET • BUFFALO 7, N. Y.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, Stonington, New York, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston, Charlotte

FARREL
The Gear with a Backbone

Farrel-Birmingham

FB-389

SPEED REDUCERS

AVAILABLE

TO BE MADE UP FOR

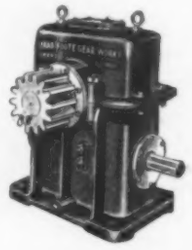
PROMPT DELIVERY

(SOME RATIOS IN STOCK)

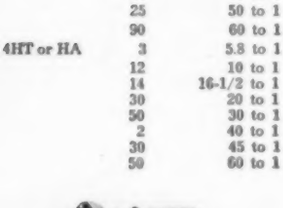
WORM GEAR AND GYRO SPEED REDUCERS

Worm Gear Speed Reducers

SIZE	QUANTITY	RATIO
3RT	70	5-1/6 to 1
	43	10 to 1
	19	15 to 1
	88	20 to 1
	22	25 to 1
	120	30 to 1
	150	40 to 1
	74	50 to 1
	50	60 to 1
3-3/4HT	5	5-2/5 to 1
	3	7 to 1
	25	10 to 1
	50	14-1/2 to 1
	9	20 to 1
	60	30 to 1
	50	40 to 1
	25	50 to 1
	90	60 to 1
4HT or HA	3	5.8 to 1
	12	10 to 1
	14	16-1/2 to 1
	30	20 to 1
	50	30 to 1
	2	40 to 1
	30	45 to 1
	50	60 to 1



CATALOG 114



CATALOG 112

OFFERED
Subject
to
Prior Sale

~

Write for prices
and
delivery dates

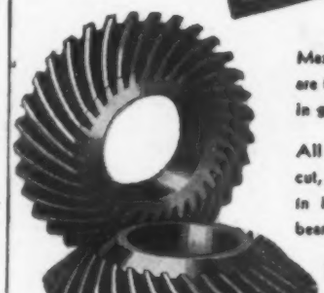
Gyro Speed Reducers

SIZE	QUANTITY	RATIO
G-7½	16	24 to 1
	1	30 to 1
	13	40 to 1
	9	50 to 1
	4	56 to 1
	10	60 to 1
	4	80 to 1
	4	100 to 1
	5	120 to 1
	4	200 to 1
	2	408 to 1
	4	480 to 1
G-15	7	30 to 1
	9	40 to 1
	4	50 to 1
	35	60 to 1
	9	81-3/5 to 1
	55	120 to 1
	1	140 to 1
	3	360 to 1
G-25	1	16 to 1
	10	40 to 1
	39	60 to 1
	1	66 to 1
	9	100 to 1
	10	116 to 1
	28	118 to 1
	1	142 to 1
	10	200 to 1
	6	235 to 1
	1	247 to 1
	9	360 to 1
	8	480 to 1
	3	950 to 1
G-40	2	26 to 1
	7	25 to 1
	1	30 to 1
	8	40 to 1
	6	50 to 1
	4	101 to 1
	13	120 to 1
	3	480 to 1
	3	610 to 1
	4	1200 to 1

BRAD-FOOTE GEAR WORKS

1309 SO. CICERO AVE. CICERO, ILL. DEPT. A

CINCINNATI . . .
Spiral Bevel Gears
HAVE MUCH TO OFFER



Maximum performance and dependability are two qualities that are absolutely essential in gears for any industrial purpose.

All Cincinnati Spiral Bevel Gears are cut, tested, matched, lapped and marked in individual sets . . . to insure correct bearing location on teeth.

For smooth, efficient operation at high speeds . . . specify Cincinnati Gears, ***Good Gears Only!***

THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

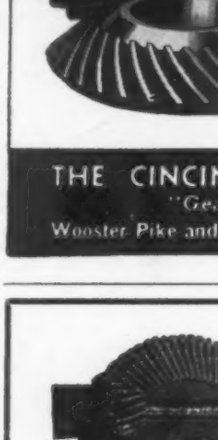
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

BILGRAM
QUALITY
GEARS

BILGRAM TRADE MARK

ALL TYPES • ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.



GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅜" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after September 1, 1947)

MACHINES AND ATTACHMENTS

1 SURFACE GRINDERS—Reid Brothers Co., Inc., Beverly, Mass. 12-page bulletin describes various surface grinders, including hand- and power-feed models. Covers fingertip controls, wet-cutting attachment, dust control.

2 DRILL PRESSES—Canedy-Otto Mfg. Co., Chicago Heights, Ill. 16-page bulletin 90 includes sliding-head floor drills, radial drill and bench drills. Gives detailed specifications on entire line.

3 RIVET SETTING—Chicago Rivet & Machine Co., Bellwood, Ill. 48-page catalog gives information on the use of split and tubular rivets. Describes and gives specifications of line of automatic rivet-setting machines.

4 FEED STOP—Exacta Mfg. Co., New Haven, Conn. 2-page bulletin describes automatic-feed stop for threading, turning, boring. It is designed to stop lathe carriage at any predetermined point. Relative position of lead screw is said never to be lost.

5 PLASTICS EQUIPMENT — Elmes Engineering Works of American Steel Foundries, Chicago 7, Ill. 12-page bulletin 5200 on hydraulic equipment for the plastics industry includes transfer and compression-molding presses, laboratory and hobbing presses, accumulators and pumps. 4-page bulletin 1030B on Elmes hobbing presses also available.

6 LUBRICATION FOR GRINDING—The Texas Co., New York 17, N. Y. 12-page July issue of "Lubrication" is devoted to subject of "Lubrication of Grinding Machinery." Discusses, for example, effects of speed of machine on choice of lubricants.

7 LATHE—The Monarch Machine Tool Co., Sidney, Ohio. 24-page bulletin 302 covers Model EE 10-in. Toolmaker's lathe. Unit has gearless, stepless spindle speeds and wide range of threads and feeds. Operated by 3-hp. motor, it has 12½-in. swing over bed.

8 ROTARY SHEARS—Kling Bros. Engineering Works, Chicago 51, Ill. 8-page bulletin 245 on rotary shears with 48- and 36-in. throats. Units can cut straight lines, circles, odd shapes, reverse curves and perform other jobs. Also available is 4-page bulletin on grinders, friction saws, bulldozers, bending rolls and other units.

9 DRILLING MACHINES—Bryant Machinery & Engineering Co., Chicago, Ill. 18-page catalog 400 describes drilling machines made by Cleereman Machine Tool Co. Units have 12 speeds and 9 feeds which are lever selected.

10 PUNCH PRESSES—L & J Press Corp., Elkhart, Ind. 8-page bulletin on open-back inclinable punch presses includes specifications for 19 models ranging from 5- to 79-ton crankshaft pressure.

11 SPECIAL MACHINERY — Lake Erie Engineering Corp., Buffalo 17, N. Y. 16-page bulletin describes facilities of corporation for manufacturing special industrial machinery. Illustrates various departments and equipment.

12 DROP HAMMER—Pneumatic Drop Hammer Co., Braintree, Mass. 12-page bulletin describes stationary anvil and double-action drop hammers which lift by air pressure and drop by gravity. On double-action hammer, heads are said to meet with same force at impact and to stop without shock or vibration to supporting members.

13 SHAFT-DUPLICATING — The American Tool Works Co., Cincinnati 2, Ohio. 18-page bulletin 35 describes hydraulic shaft-duplicating lathe which reproduces from a templet. Two models have 18½ and 22½ in. swing over bed and carriage wings. Both have 27 speeds.

14 RIVET SETTING—The Milford Rivet & Machine Co., Milford, Conn., and Elyria, Ohio. 20-page catalog 47-M describes and illustrates foot-operated and automatic machines for setting tubular, compression and split rivets.

15 AIR TOOL—Snow Mfg. Co., Chicago, Ill. Catalog folder includes descriptions and specifications of air-operated electrically controlled unit for threading, drilling or tapping.

16 RADIFORM—W. F. Meyers Co., Inc., Bedford, Ind. 4-page bulletin describes Radiform wheel and tool former designed to support tools to be formed on a tool and cutter or surface grinder without first forming the wheel.

17 BORING—National Automatic Tool Co., Inc., Richmond, Ind. 8-page bulletin 447 describes Natco Borface units for boring, counterboring and chamfering large bores on a production basis. The units can be mounted horizontally, vertically or at an angle to fabricate multi-way boring machines.

TOOLS AND ACCESSORIES

18 TOOLS—Melin Tool Co., Inc., Grand Rapids 7, Mich. 76-page catalog covers line of tools including end mills, router bits, center drills, countersinks, special and other tools. Also gives prices and several pages of tables (such as allowances for fits).

19 GRINDING WHEELS—Norton Co., Worcester 6, Mass. 32-page catalog describes grinding wheels for foundries, steel mills, forge and welding shops. Also covers core files, rubbing bricks and wheel dressers.

20 JIG—Superior Sales & Mfg. Corp., Cincinnati 2, Ohio. 6-page bulletin on Speed Jig which can be used as a precision layout fixture, as a master setup for coordinating drill jigs, and for other uses. Consists of precision-made parts which can be assembled in infinite variety of jig and fixture patterns.

21 CARBIDE TOOLS — Wendt-Sonis Co., Hannibal, Mo. 12-page catalog 646 describes carbide-tipped tools such as twist and gage drills, boring bits and pulley-grooving tool. Also covers solid-carbide tools such as rotary files and boring bits.

22 SCREW-MACHINE TOOLS—Boyar-Schultz Corp., Chicago 12, Ill. 24-page booklet describes tools for screw machines such as burnishing, turning and knurling tools; adapters; revolving stops; grinding fixture; and drill and reamer holders.

23 CUTTERS—Weddell Tools Inc., Rochester, N. Y. 28-page "Tri-Bit Cutter Manual" covers tools which use triangular toolbits. Includes carbide-tipped and standard face mills, side mills, fly cutters, arbors, boring bars and special tools.

Example

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24 MILL GAGES—Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. 16-page bulletin covers Electrolimit continuous gage for measuring thickness of strip material. Also describes foil, non-metallic continuous, and strain gages.

25 ABRASIVE WHEELS—Charles H. Besly & Co., Chicago 6, Ill. 48-page catalog describes Besly-Titan resinoid-bonded abrasive disks and wheels. Disks have Steelbac design and are bolted to disk wheels. Several Besly grinding machines are also described.

HEAT-TREATING AND WELDING

26 SALT BATHS—Industrial Chemicals Div., American Cyanamid Co., New York 20, N. Y. 28-page bulletin discusses the use of salt baths for heat-treating. Traces development of method. Includes information on carburizing, maintenance of baths, safety precautions.

27 MR. WIDGET—Sciaky Bros., Inc., Chicago 38, Ill. 52-page booklet tells how Mr. Widget, a man of success, becomes more of a success by using three-phase welders. He is helped by frequent cartoons, by "Three-Phase" (a cousin of Superman), and by several pages of technical data.

28 WELDING, CUTTING — Wall Chemicals Div., The Liquid Carbonic Corp., Chicago 23, Ill. 28-page catalog describes Gasweld welding and cutting equipment and supplies. Also available is 16-page price and parts list.

29 PLASTICS PREHEATING—Despatch Oven Co., Minneapolis 14, Minn. 34-page bulletin on ovens for preheating and drying plastics. Units are flap-door types, can be readily moved to new locations.

30 GAS CARBURIZING — Surface Combustion Corp., Toledo 1, Ohio. 16-page bulletin SC-134 on modern gas carburizing tells how the process is accomplished. Explains suspended carburization, carbon restoration, dry cyaniding. Includes photomicrographs.

31 RESISTANCE WELDING—Ampco Metal, Inc., Milwaukee 4, Wis. 24-page bulletin 68B covers Ampcoloy resistance-welding electrodes and alloys. Contains spot-welder tips and holders, seam-welder wheels, accessories. Tables of properties of alloys included. 12-page price list also available.

PLANT SERVICE EQUIPMENT

32 BLUEPRINTING—The C. F. Pease Co., Chicago 18, Ill. 238-page book describes line of blueprinting and white-printing machines and accessories, sensitized papers and cloths, and a wide range of drafting-room needs.

33 DUST CONTROL—American Air Filter Co., Inc., Louisville, Ky. 20-page bulletin 272A on Roto-Clone Type D Dynamic Precipitator used for dust control which combines features of exhauster and dust separator in single unit.

34 BATTERIES—Gould Storage Battery Corp., Depew, N. Y. 24-page catalog 100 on Kathanode Glasskiad batteries for industrial truck and tractor service. Includes discussion of theory of lead-acid storage battery.

35 INDUSTRIAL TRUCKS — Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich. 12th-anniversary issue of "Material Handling News" includes articles on new Clark developments such as "Clarkat" towing tractor, "Yard-lift" fork trucks and other units.

36 HEATING, VENTILATING — Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. 12-page bulletin 25B6183 on products for heating, ventilating, and air conditioning. Describes Texrope V-belt drives, centrifugal pumps, motors, motor controls, and other products.

37 ACCIDENT PREVENTION—Div. of Labor Standards, U. S. Department of Labor, Washington 25, D. C. 12-page bulletin 86 "Guide to Industrial Accident Prevention through a Joint Labor-Management Safety Committee." Describes method by which committee may be established.

PARTS AND MATERIALS

38 MAGNETIC MATERIALS — Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. 32-page brochure "Magnetic Materials" explains basic functions of core materials. Uses color charts, diagrams and pictures to make complicated properties easy to understand.

39 CONDUCTOR SELECTOR—Paranite Wire and Cable Div., Essex Wire Corp., Ft. Wayne, Ind. Slide-rule type selector provides means to select conductor of adequate amperage-carrying capacity under varying wiring conditions.

40 ELECTRICAL DIAGRAMS—General Electric Co., Schenectady, N. Y. 23-page bulletin GET-1293 explains purpose and use of electrical diagrams supplied with GE switchgear equipment. Explains one-line, elementary, connection and interconnection diagrams.

41 CARBIDES—Adamas Carbide Corp., New York 23, N. Y. Catalog and price list includes standard styles, sizes and tolerances recently adopted by principal tungsten-carbide manufacturers. Gives standard and special grade designations.

42 CHAIN DRIVE—Link-Belt Co., Chicago 1, Ill. 16-page bulletin 2010 describes 3-16-in. pitch silent chain for fractional hp. drives. Book contains information on how to select chain drives.

43 SPEED REDUCERS—Olson Industrial Products, Inc., Lynn 10, Mass. Two 4-page bulletins describe helical-gear speed reducers with ratios from 2:1 to 52:1. Motor may be attached to top of unit by special support.

44 PERMANENT MAGNETS—Thomas & Skinner Steel Products Co., Indianapolis, Ind. 16-page bulletin on permanent magnets, their use, design and fabrication. Gives comparative properties of various magnetic steels and alloys.

45 CONTROLLED AIR — The Bellows Co., Akron, Ohio. 16-page bulletin CL-10 covers "Controlled-Air" powered devices such as motors, vises, hydro-checks, air cylinders, control valves and accessories.

46 TUBE COUPLINGS—The Parker Appliance Co., Cleveland 12, Ohio. 44-page price list on tube couplings for industrial use. Also available are two 4-page bulletins on flareless couplings and angle and offset valves.

47 ELECTRICAL ALLOYS—Driver-Harris Co., Harrison, N. J. 72-page catalog R46 covers Nichrome and other high nickel electrical alloys. Includes charts and graphs of properties and specifications.

48 SPEED REDUCERS — Universal Gear Corp., Indianapolis 7, Ind. 72-page catalog 600 on heliocentric and helical speed reducers. Includes rating tables, dimensions, prices.

49 SHAFT SEALS — Schwitzer-Cummins Co., Indianapolis 7, Ind. 34-page catalog describes automatic shaft seals which have all metal parts enclosed and protected against corrosion. Includes 11 pages of blueprints of various seal assemblies.

50 FLOW RATE—Fischer & Porter Co., Hatboro, Pa. 24-page catalog 25-E describes Flowrater instruments for measuring flow rate of liquids and gases. Units can work on horizontal and vertical runs.

51 THERMOCOUPLES—Thermo Electric Co., Fairlawn, N. J. 28-page catalog includes aircraft and engine thermocouples, industrial thermocouples and thermocouple leadwires. Illustrates all items.

52 AIR CONTROL—Logansport Machine Co., Inc., Logansport, Ind. 48-page catalog 90 covers air control valves and accessory equipment. Gives special section on typical applications with circuit diagrams.

53 LAYOUT FLUID—Dayton Rogers Mfg. Co., Minneapolis 7, Minn. Free sample of layout fluid which is brushed onto metal surface. Said to dry instantly and provide pronounced contrast against background.

54 V-BELT—Manheim Mfg. & Belting Co., Manheim, Pa. 24-page bulletin describes Veelos link V-belt which is said to be adjustable to any length and adaptable to any drive. Belts come on stock reels, and any length may be uncoupled.

55 CHAINS AND SPROCKETS — Diamond Chain Co., Inc., Indianapolis 7, Ind. 96-page catalog covers roller-chain drives. Five sections, provide engineering information, specifications and prices, chain attachments, non-corrosive chains, sprockets.

D.O.James
ESTABLISHED 1888

GEARS For INDUSTRY

Since 1888 . . .

We have been making many types and sizes of gears for industry. Vast plant facilities of the most modern gear cutting equipment assure capable handling of your *production* or *special* gear requirements.

Your Gear Inquiries Receive Prompt Attention

HELICAL GEARS—Made from 1" to 60" in diameter and from 24 DP to 1½ DP.

BEVEL GEARS—Size range from 1" to 60" in diameter and from 24 DP to 1½ DP.

SPUR GEARS—Size range from ¾" to 150" in diameter. 32 DP to ¾ DP.

HERRINGBONE GEARS—Made from 1" to 60" in diameter and from 10 DP to 1½ DP.

SPIRAL BEVEL GEARS—Made from 1" to 30" in diameter and 24 DP to 1½ DP.

WORM GEARS—Made from 1" to 100" in diameter and from 24 DP to 1 DP.

MACHINE CUT RACKS—Cut in any length with teeth of 24 DP to 1 DP.

It's new and complete . . . and contains the latest information available . . . on the Engineering and Manufacture of Gears and Gear Reducers, Racks and Flexible Couplings.

UPON REQUEST *we will send Catalog 1000 to gear and gear transmission engineers.*

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1140 West Monroe Street, Chicago 7, Illinois

MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER

for the Finest in **GEARS**
It's **BRAUN** *First!*

When you need gears of any description or quantity, check with BRAUN first. You will find that the large Braun plant with its up-to-the-minute equipment and staff of thoroughly experienced personnel are a combination that spells precision workmanship, fair price, and prompt service.

Send your prints and specifications for an estimate.

There is no charge!

MORE BRAIN CAN BRAUN

BRAUN GEAR COMPANY
1592-96 Atlantic Avenue, Brooklyn 13, N. Y.

This Grand Rapids No. 15 Motor Driven Hand Feed Surface Grinder can, in many instances, be used more profitably than the more costly Hydraulic Feed Surface Grinders . . . and we make both types.

Write for descriptive bulletin

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
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...send your specs to

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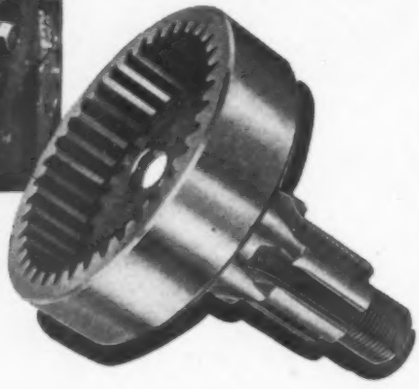
MANY manufacturers find it a good habit . . . and a profitable one . . . to "send specs to Sier-Bath" for precision gears. This is particularly true where tolerances are so close as to require finishing by shaving or grinding methods. For Sier-Bath is equipped with the most up-to-date machinery for shaving and grinding a broad range of types and sizes of gears, worms and splines. Start a good habit now . . . send your specs to Sier-Bath.



GEAR RANGES

● Spur, helical and worm gears to 48" diameter 3 D.P. and finer; straight tooth bevel gears 32 pitch to 3 pitch, up to 23" P.D. depending on ratio. Gears shaved from 1" to 24". Continuous herringbone gears generated by Sykes method up to 37" O.D. Worms and threads precision ground on J. & L. Thread Grinder to extremely close tolerances. Spur gear grinding up to 16" diameter; helical gear grinding up to 10" diameter. Involute and straight side splines ground up to 42" between centers.

ALSO MAKERS OF SIER-BATH SCREW AND GEAREX ROTARY PUMPS

FOUNDED 1905 MEMBER A.G.M.A.

Sier-Bath
GEAR and PUMP CO., Inc.

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INDIVIDUAL ATTENTION

Whether your gear requirements involve standard cut-gears (which we have in stock), or special gears to be cut to your specifications, you can depend on GRANT to give you the kind of service which has resulted in a continuous growth of our business over a period of 64 years.

GRANT GEAR WORKS
BOSTON, MASS.

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QUALITY GEARS CUT TO ORDER

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● MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MP MEISEL PRESS MFG. CO. MP
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GEAR CUTTING MACHINES

Well Designed
Good Features
Create Production Advantages

43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

WHERE HAVE YOU SEEN PRICES LIKE THESE?

Adjustable MULTIPLE SPINDLE DRILL HEAD

Adaptable to 14" x 17" Machines
6" Drilling Area

HEAD CAN BE FURNISHED WITH 3-TO 8 SPINDLES

1/4 CAPACITY
21/32 CENTERS

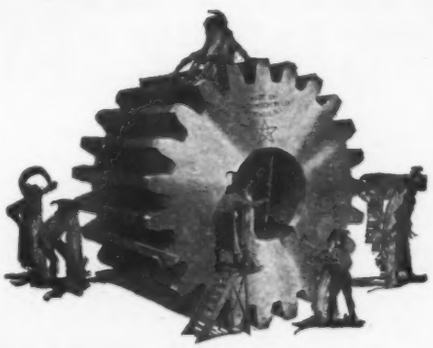
PRICES

3 Spindle Head			$150.00	6 Spindle Head			$170.00
4	"	"	155.00	7	"	"	180.00
5	"	"	160.00	8	"	"	200.00

US HEADS SINCE 1915

• *Delivery in Two Weeks*

UNITED STATES DRILL HEAD CO.
CINCINNATI 4, OHIO



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CUT ALL GEARS TYPES

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Better Gear Products

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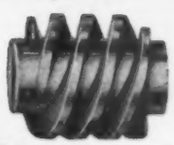
"HARTFORD" for Gears, Cams, Thread-Grinding



OUR SERVICE INCLUDES:

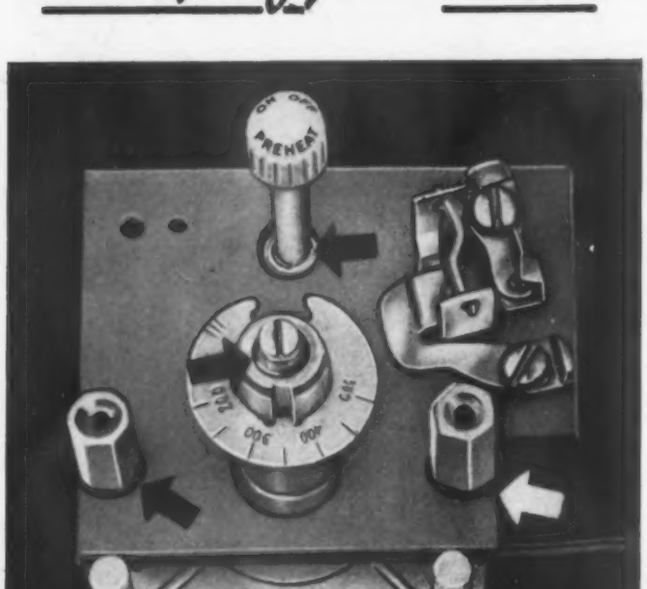
- . . . cutting gears of every description exactly to specifications
- . . . grinding gears, cams and threads
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

RETAINING RINGS

Simplify and Save



On these beautifully designed Wilcolater Thermostats our retaining rings are "naturals" for simplification and economy. On such highly efficient products, every part is designed for compact reliable service.

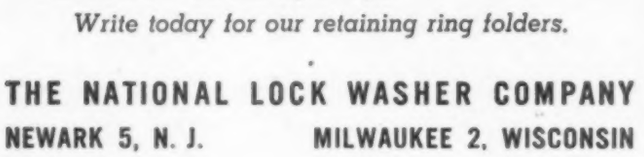
And on hundreds of other products and machines these effective yet inexpensive artificial shoulders are saving money and material – eliminating the need of extra parts, cutting down assembly costs.

Don't cut down shafts to make shoulders –*groove* your shafts and housings, and use steel retaining rings.

Write today for our retaining ring folders.

THE NATIONAL LOCK WASHER COMPANY

NEWARK 5, N. J. **MILWAUKEE 2, WISCONSIN**



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SAVE OVER 50% FLOOR SPACE THE HAMMOND WAY

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NO-DUST GRINDER

- Requires only 6½ square feet.
- Protects employees' health.
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A self-contained Grinder and Dust Collector for 10", 12" and 14" wheels. Write for Bulletin No. 104.

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Short or production runs guaranteed workmanship reasonable prices

THE PRECISION GEAR CO.

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Original System of Inserted Blade

OK ***Milling and Boring Tools***

See Issue March 27, 1947 American Machinist

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SHELTON, CONN.

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FEEDS
AUTOMATIC EQUIPMENT
THE V&O Press Co.
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Shops that get the business use SCHERR PRECISION TOOLS

Optical inspection tools—Microscopes—Projectors—Magnifiers—Time-saving Specialties for the Toolroom.

Tell us your inspection problems

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Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

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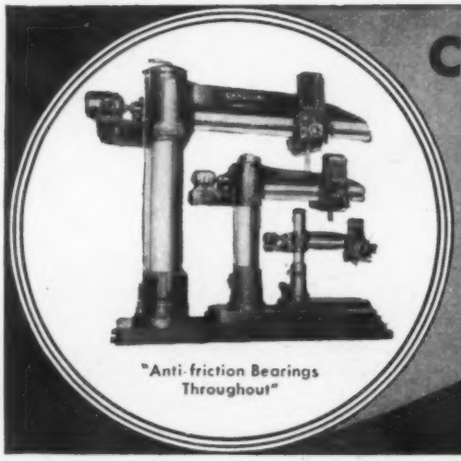

CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

from FLAT SURFACES to INTRICATE SHAPES with the New DI-ACRO BRAKE

- ROK-LOK—sensitive material clamp increases accuracy
- DOUBLE-EDGED FORMING BLADE for close reverse bends
- NEW PRECISION STOPS control angularity of bends

This versatile metal forming machine was developed for use in model shops, experimental laboratories and production departments where it often replaces dies for all types of precision forming operations. Di-Acro Brakes will form a great variety of materials including bronze, stainless steel, aluminum and bi-metals.

WRITE FOR CATALOG New edition of 40-page Di-Acro Catalog contains detailed information on all Di-Acro Brakes, Shears, and Benders and illustrates how these precision machines can be used individually or cooperatively for "DIE-LESS DUPLICATING.

◀ DI-ACRO is Pronounced "Die-Ack-Ro"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE • LAKE CITY, MINNESOTA

Emblematic of faithful service to our country in its time of need, the honorable discharge emblem *points out* its wearers as upstanding men and women who did a good job . . .

Just as this badge designates a job well done, your product marking designates the outstanding quality in it. Its marking identifies it as yours, protects it and you, and facilitates handling in shipment.

LO-STRESS STAMPING

Matthews round face "Lo-Stress" stamps have gained widespread acceptance for marking parts placed in torsional or tensive stress and where internal stresses of heat treated steels may break out at point of marking. Complete information in Bulletin A-2.

Jas. H. Matthews & Co., for nearly a century the complete marking house, has the answer to your question of how to mark your product . . . a complete line of marking devices to suit every need. Consult us for the answer to your problem.

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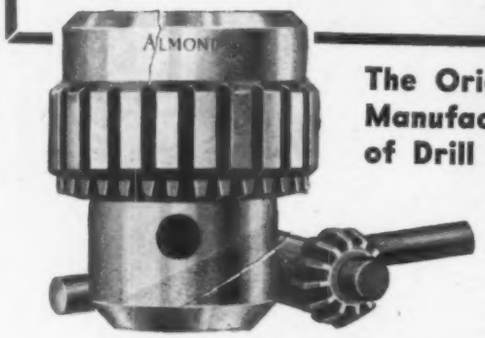
NEW YORK, BOSTON, CHICAGO, PHILADELPHIA, NEWARK, SYRACUSE

District Sales Offices: Cleveland, Cincinnati, Birmingham, Dallas

Almond Drill Chuck



The Original Manufacturers of Drill Chucks

. . . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

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Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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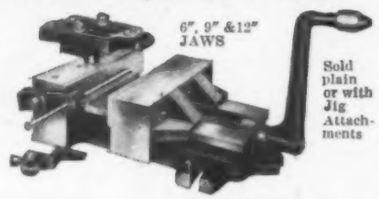
GRAHAM MULTI-PURPOSE VISE

Usable plain or as a repeat-operation jig or fixture, this Vise with special attachments saves hundreds of toolmaking hours. Sizes to 124 lbs. for planer, shaper, miller, grinder, drill press, radial.

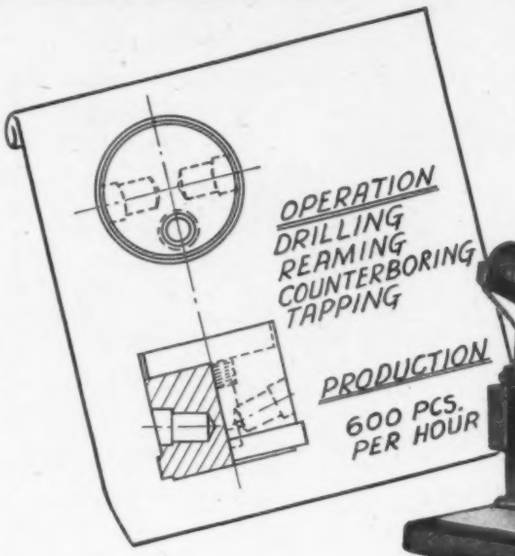


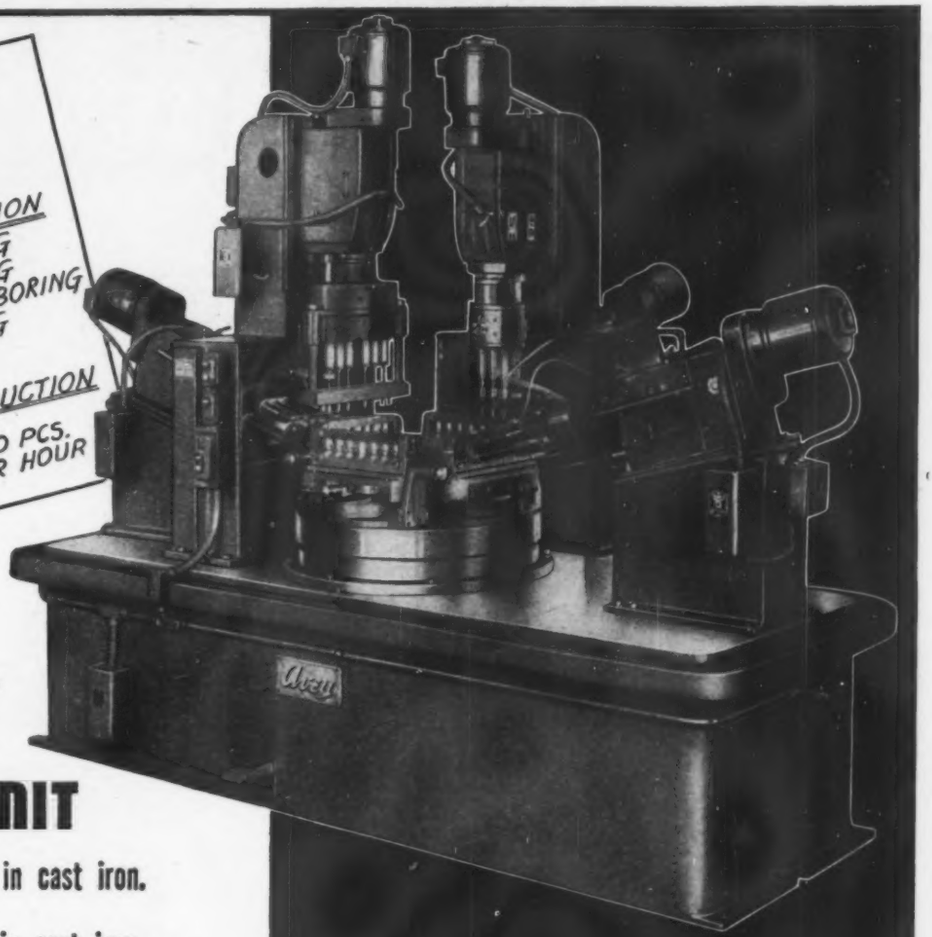
Sold plain or with Jig Attachments

BULLETIN 41
describes and prices above Vise, also our KNURL HOLDER FITTING LATHE TURRET

GRAHAM MFG. CO.
86 Bridge St. East Greenwich, R. I.

Avey Automatic METHOD No. 7





THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

Designed for multiple operations on a multiplicity of parts—(clamping six parts at a time)—parts with identical operation at 180°—(index fixture on index table)—drilling, reaming, and tapping.

Send for Engineering Bulletin #645

Accelerated production by multiple fixturing — free loading or indexing while machine is in operation, multiple operations in time required for longest single operation.

METHOD No. 7 — Higher production, lower cost per piece, duplicate operations on opposite side of work performed at one clamping — high quailty work obtained speedily, efficiently with minimum of supervision.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

Tool life greatly increased by reconditioning cutting oil *with*
BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**
Designers and Builders of Centrifugal Machinery

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The Air-Hydraulic Press is imbedding the nickel chrome heating element into the mud cast ceramic insulation of the Glide-O-Matic electric iron . . . maintaining a uniform thickness all around the coil. This was the toughest problem the Century engineer met in setting up the production line.

AIR-HYDRAULIC PRESS DOES BETTER ASSEMBLY, FORMING, MARKING, ETC.
2 MODELS — 2½ AND 6 TON CAPACITIES

Century's chief engineer says that the AIR-HYDRAULIC PRESS solved this production line "bug" so efficiently that the Glide-O-Matic electric iron has received one of the highest efficiency ratings in the field.

Do you work in metals, plastics, leathers? Investigate the operating advantages of this new press . . . no noise, no impact shock damage, no operator fatigue. Ideal for women operators. Adjust the pressure from the most delicate squeeze up to 2½ or 6 tons pressure. Operate by hand, foot, or by completely automatic controls. Ask for the new brochure showing a wide variety of work done by and specifications of these A-H Presses.

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Factory: 120 W. Middle Street, Chelsea, Mich.
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HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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Famous for
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 258, Jan. 16, '47 American Machinist

THE EASTERN MACHINE SCREW CORP., 29-40 Barclay St., New Haven, Conn.
Los Angeles: *A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 404 Vernon St., Oakland,* Canada: *F. Barber Machinery Co., Toronto, Canada.*

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Made Only by Wilson

• Development and improvement of "ROCKWELL" Hardness Testers over the years have made "ROCKWELL" scales the universal standard of hardness. A reading on the "ROCKWELL," the "ROCKWELL" Superficial or the "TUKON" Tester is the same in any language.

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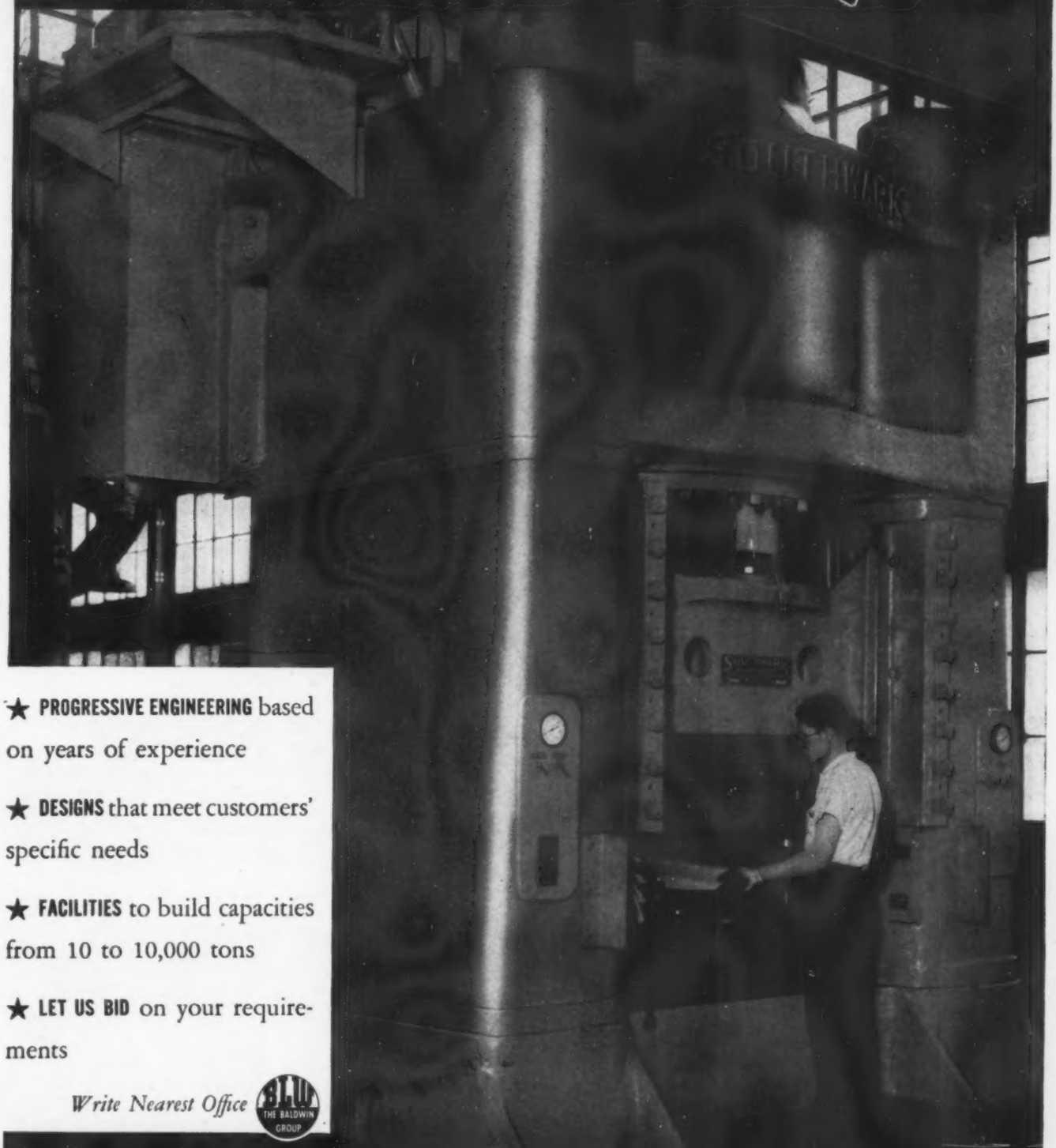

★ **PROGRESSIVE ENGINEERING** based on years of experience

★ **DESIGNS** that meet customers' specific needs

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★ **LET US BID** on your requirements

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Proof of LOWER PRODUCTION COSTS with REED Triple-Die Precision Thread Rolling!

1920 THREADS AN HOUR

Part: SPARK PLUG SHELL
Thread: 14mm x 1.25mm
Material: SAE 1315 STEEL

Rolled on the **REED** Cylindrical-Die **THREAD ROLLER** Model A22

For complete specifications, write for Bulletin A22-1.

Prove it to your own satisfaction! Send us specifications of your work and let us roll samples. We will furnish production estimates and equipment costs.

REED A22 *for*
THREADING • KNURLING • FORMING • BURNISHING • SERRATING

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237 Chandler Street, Worcester 2, Mass., U. S. A.
Mfrs. of Knurls – Thread Rolling Dies – Thread Rolling Machines

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For Faster Smoother Cleaner *Grinding* **ECONOMY**

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DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

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BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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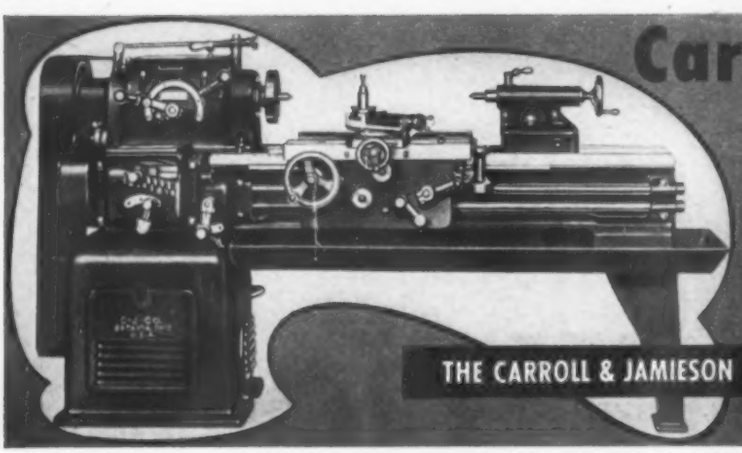

Carroll & Jamieson 16" LATHE

12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions
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THE CARROLL & JAMIESON MACHINE TOOL CO., BATAVIA, OHIO, U. S. A.

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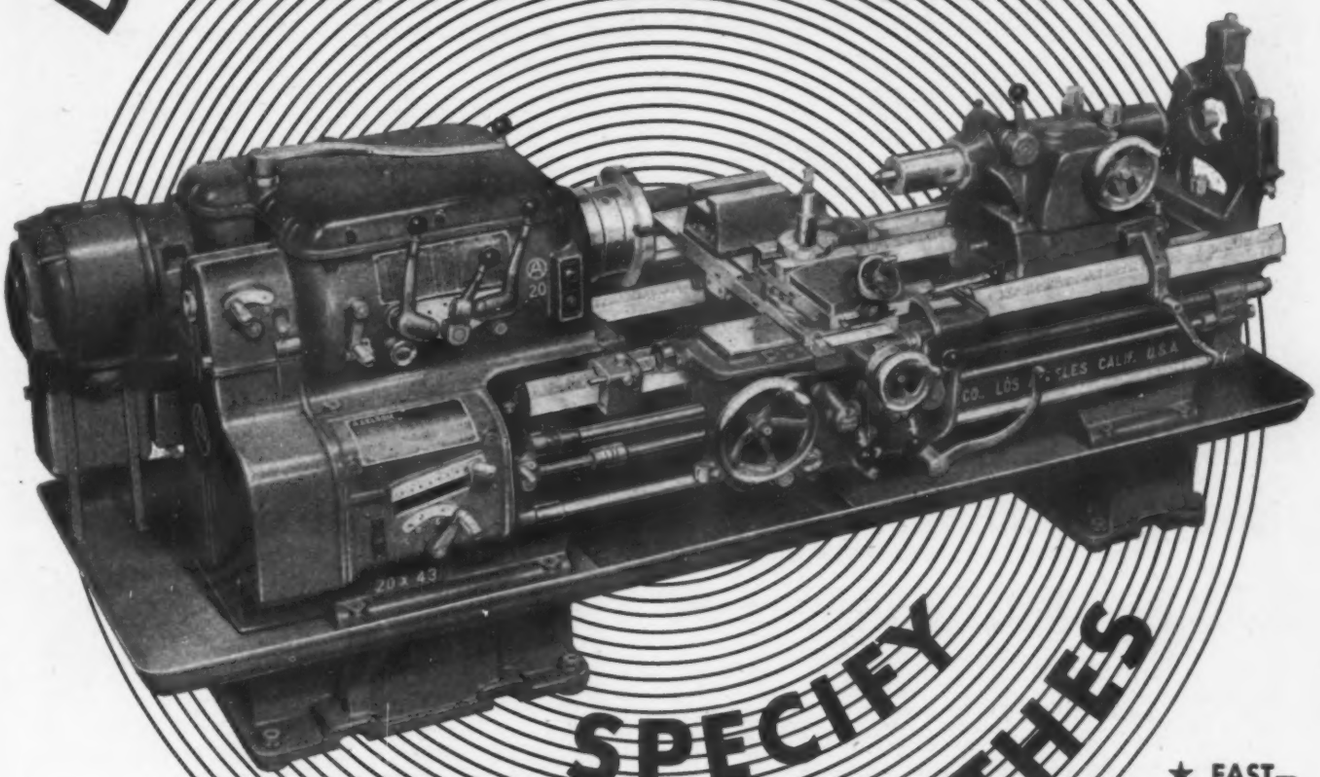

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★ ECONOMICAL—
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★ LOW PER PIECE PRODUCTION COSTS—

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

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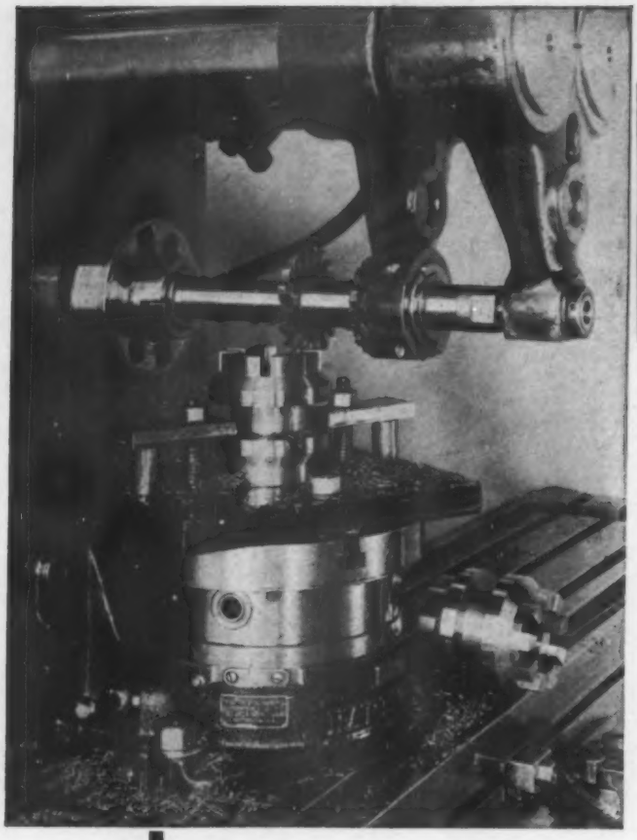
AXELSON *Lathes*

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

DEPENDABLE FOR OVER A QUARTER CENTURY



The HARTFORD SUPER-SPACER is adaptable...to the use of a wide range of attachments

Shown here, the SUPER-SPACER is equipped with a face plate on which a special holding fixture is mounted. With this attachment a holding means is provided for milling and indexing the ends of a double clutch. When work has been finished on one end of the piece, it is reversed and the part machined on the other end—a fast, convenient and accurate method of handling the job.

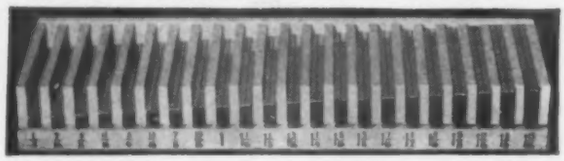
As a basis for special fixtures, the Hartford Super-Spacer provides a substantial and accurate indexing foundation at a minimum cost. In all cases rigid control of spacing operations is assured, as proved in an almost unlimited variety of uses.

Send for literature showing applications to milling, drilling, slotting and jig boring.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.



Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

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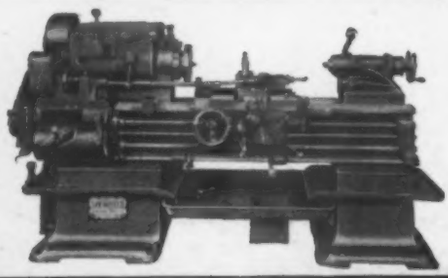
ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

SPRINGFIELD GEARED HEAD LATHES

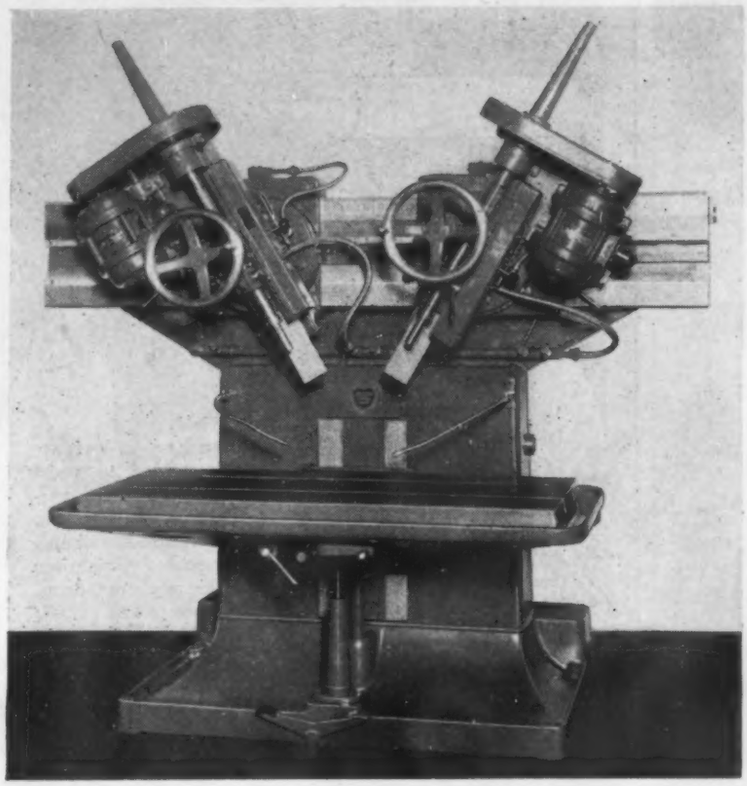


. . . versatile, efficient!

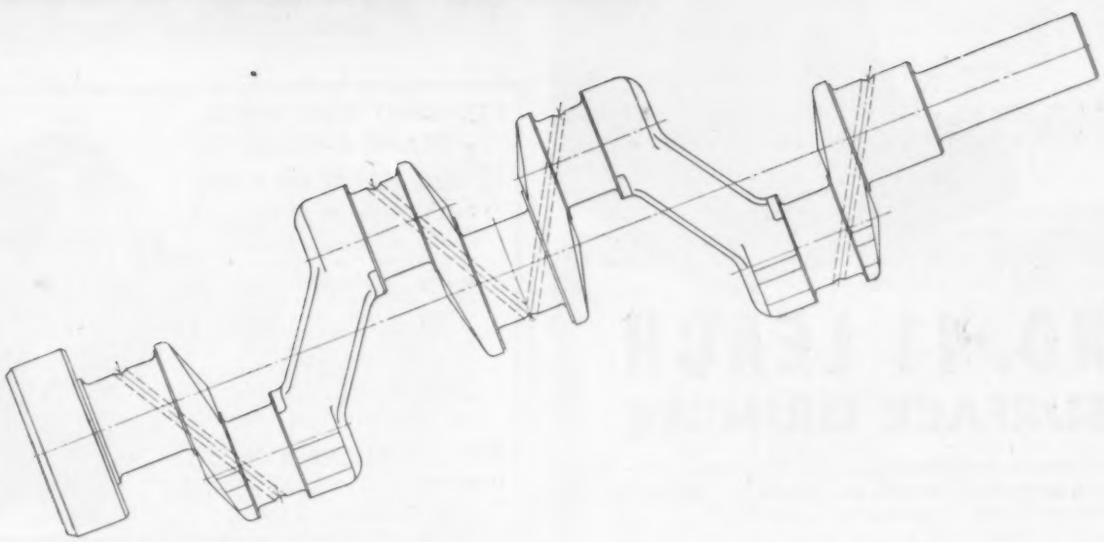
Springfield designs lathes to retain accuracy and speed over long periods of use. For quantity production or special use they're economical and extremely adaptable. Sizes available range from 14" to 30". *Write for descriptive bulletins, prices and deliveries.*

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

LELAND-GIFFORD



UNIVERSAL RAIL TYPE DRILLING MACHINE



- A handy machine for drilling angular oil holes in crankshafts.
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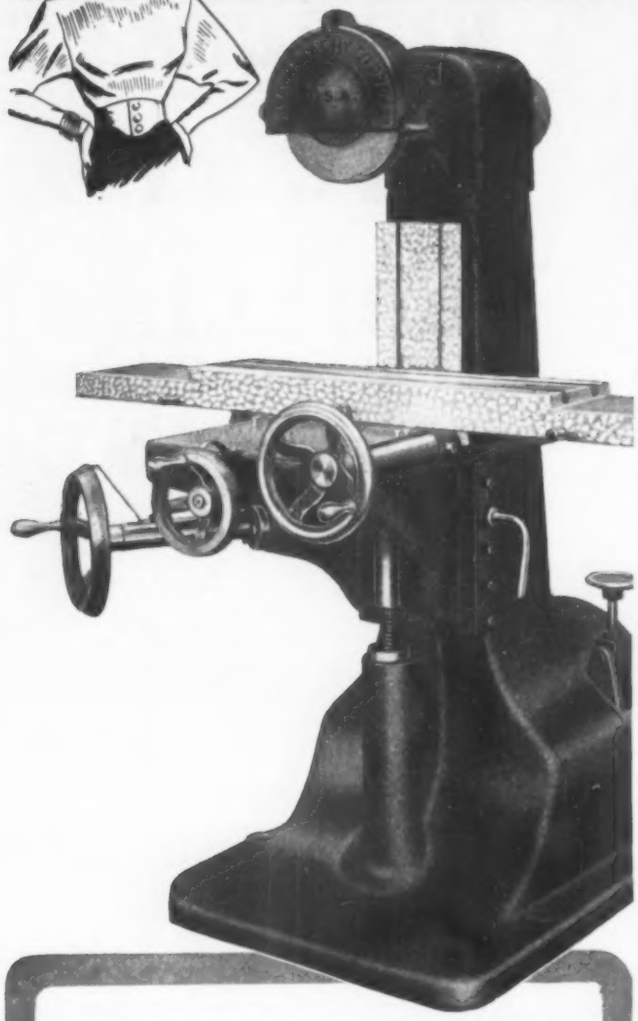

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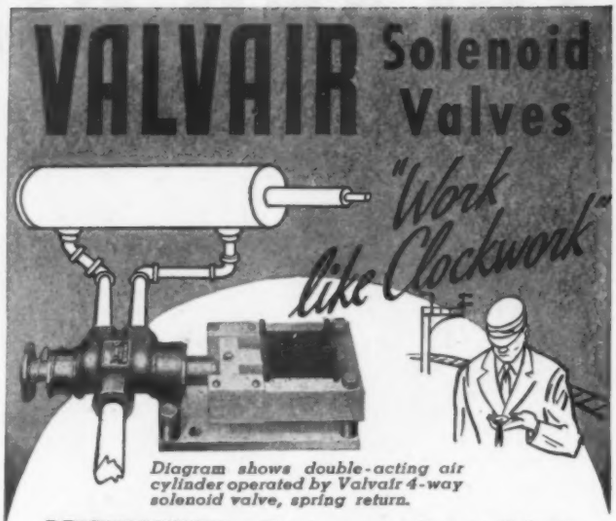

Diagram shows double-acting air cylinder operated by Valvair 4-way solenoid valve, spring return.

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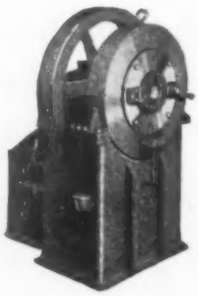

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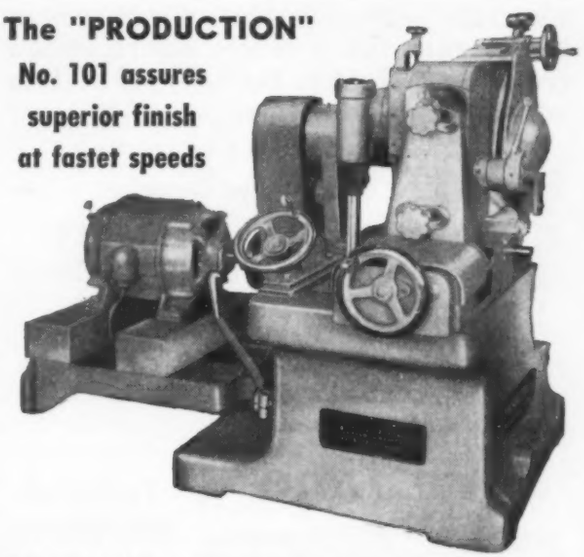

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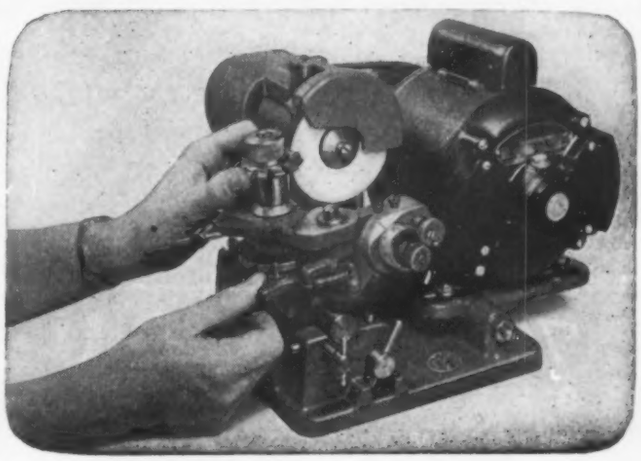

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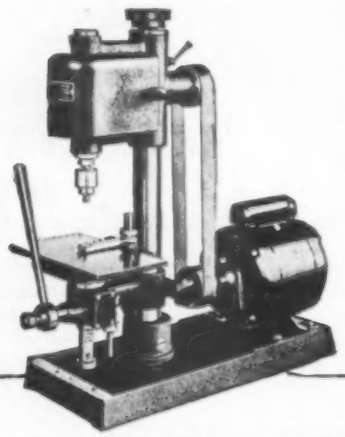

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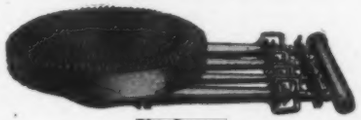

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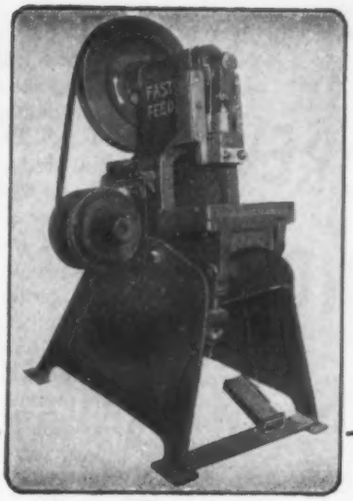

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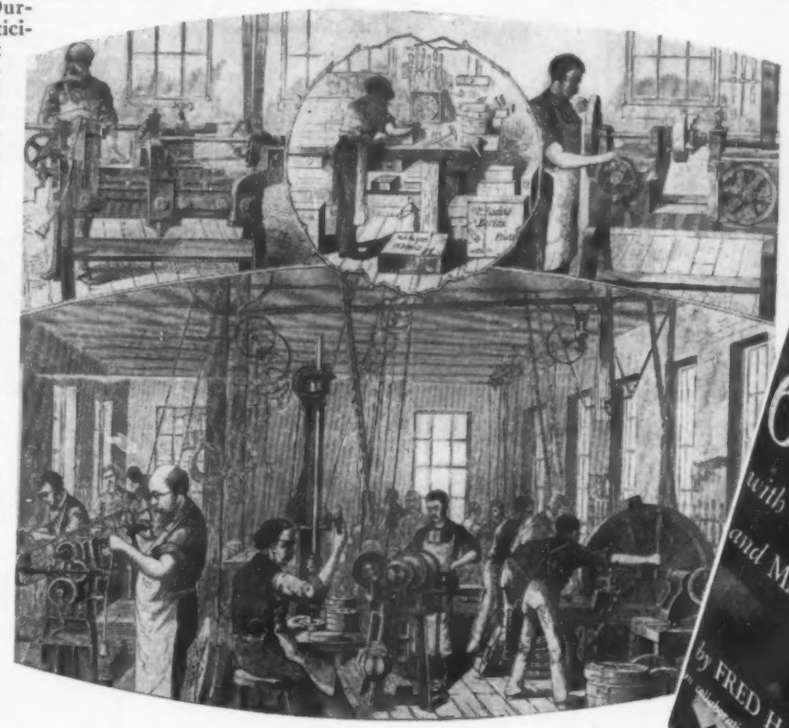

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Time for a Spring Check-up . . .

on the plan that delivers Peace of Mind

THANKS to the work of patriotic volunteers, the U. S. Savings Bonds program has carried America a long way up the road to economic security.

During 1946, in spite of all the problems and uncertainties the nation faced, sales of Savings Bonds *exceeded redemptions* by $1,389,216,000. The success of this great sales operation has helped stem the tide of inflation, has reduced public debt holdings of the banking system, and has given millions of citizens a stake in their country and a profitable investment in their own futures.

Yes, we've come a long way—but the trip isn't over! Now is the time to check up on your Payroll Savings Plan. Make sure that all your new employees are familiar with its advantages. Remind *all* your employees that there's no easier, surer way to build their own futures—and America's—than by buying Bonds regularly through the Payroll Savings Plan. Every $3 invested pays $4 at maturity!

For any help you need in conducting the Payroll Plan, call on your State Director of the Treasury Department's Savings Bonds Division.

New Savings Bonds Plan won't affect the P.S.P.

SOON the Treasury Department and the banks of America will make it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

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Announces Removal to Larger and Better Equipped Quarters at
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SPECIALIZING IN SHORT PRODUCTION RUNS
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We can handle anything in High Speed Steel up to 7" High, 12" Wide, 22" Long regardless of shape.

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Flats to 44" Diameter—Discs—Shear Plates—Washers. We specialize in holding discs flat.

Quality Work—Prompt Deliveries. Write or Wire.

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PRECISION MACHINE WORK
Mold plates, Cavity plates, Rubber molds, Hydraulic pump units and parts to specifications. Die plates for injection molding, Strain rods. Production work, turret lathe, exceptional Engine lathe operations, Milling & Drilling. Machines built to specifications. Prints will receive prompt quotations.
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
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SCREW MACHINE and TURRET LATHE PRODUCTS
Planer and Hor. Boring Mill Work. Castings Available. Gears, Sprockets, Jigs and Fixtures. Quick Delivery. Send B. P. For Quotations.
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Put Your Idle Capacity to Work
Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of American Machinist—about your facilities. Write for rates.
CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

WANTED — CONTRACT WORK
Metal Fabrication Manufacturer with extensive production experience has additional capacity in small welding plant. Can perform sawing, flame shape cutting, drilling and welding operations. Send your inquiries or drawings to
THE B-H CO., INC., CAMBRIDGE CITY, IND.

SEND B.P. FOR MFG. COMPLETE ASSEMBLIES
Tool—Jigs—Dies
Screw Machine and Turret Lathe Work
Stampings—Gears
POSSY'S TOOL & MFG. CO.
51 Meadowbrook Buffalo 6, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

CIVIL SERVICE

EMPLOYMENT OPPORTUNITIES in the Navy Dept.—east and west coast areas—for scientists and technicians: For current vacancies consult the Scientific Personnel Bulletin of the Office of Naval Research on file at Naval activities, colleges, schools, professional societies, scientific journals, regional offices of the U. S. Civil Service Commission, etc., or address specific inquiries to the Scientific Personnel Branch, Navy Dept., Washington 25, D. C.

POSITION VACANT

OLD ESTABLISHED company manufacturing a major automobile part which is sold directly to vehicle manufacturers has opening for experienced machine maintenance foreman. Plant located in Central Indiana employing 600 men. All types of machining operations, heat treating and grinding. Modern equipment, automatics bar and chucker, hydraulic operated machines, precision finishing, etc. Good connection for reliable man. Present foreman retiring after 25 years. State age, experience, salary expected, etc. All communications will be treated in strictest confidence. P-1017, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Additional Employment Advertising on Page 276

SELLING OPPORTUNITIES OFFERED

WANTED—SALESMEN experienced in mill supply and hardware jobber contact, with a technical knowledge of the tap and die business, for New England. Also Pittsburgh, Cleveland and Cincinnati-Dayton territories. Write fully giving business background, education, age and marital status. This job requires a lot of traveling and knowledge of the trade in your area. Adequate salary and expenses will be paid the men selected. Address SW-1101, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL ENGINEER and salesman wanted for Eastern territory. Salary and commission full résumé first letter. SW-1143, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 443 Delaware Ave., Buffalo 2, N. Y.

SPANISH METALLURGICAL FACTORY wishes to contact an Agent well specialised in the buying of machine tools and machinery for casting, laminating, steel forge. *Write* PATRICIO ECHEVERRIA, S.A. Lagazpia—Guipuzcoa (Spain).

POSITIONS WANTED

PLANT SUPERINTENDENT or Manager. Age 49, 25 years' practical experience manufacturing light, heavy, precision, sheet metal products, tools. Dies, precision machining, stamping, forming, welding finishing, know how, mass line production, cost, continuous labor relations. Salary $7200. Location immaterial. PW-952, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PERSONNEL MANAGER: 11 years' experience in planning and supervising personnel programs in steel, aluminum and foundry industries. Background of engineering education, engineering and sales work. Presently employed in administrative capacity by Federal government. Desire position with company whose basic industrial relations policy is to develop essential cooperation between management and employees. PW-965, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 276)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATES

(Not available for equipment advertising)

60¢ per line, minimum 4 lines. To figure advance payment count 6 average words as a line

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A. M. July 16th will appear in the issue of July 31st subject to limitation of space available

AVAILABLE

PLANT MANAGER OR MANUFACTURING EXECUTIVE

(M.E.) with management manufacturing and engineering background in the production of screw machine products, high pressure fittings, deep drawn containers, stampings etc., now responsible for budget control of all manufacturing in a operation exceeding $12,000,000 yearly and involving the control of over 3000 employees. Broad knowledge of manufacturing requirements in European and South American plants.

PW-1201, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Outstanding Manufacturing Management Executive

Competent seasoned mechanical engineer, seeking a permanent connection with a live progressive organization.

Varied experience includes thorough knowledge and capacity for materials management, maintenance, mass precision production and jobbing work, process planning, tool design, tool making, plant layout, assembly operations, forge shop, stamping and press room, grey iron and malleable foundries.

Details and references furnished on request to responsible parties stating their requirements. Address reply to

PW-1088, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE

NORTHERN CRANE 10 TON TYPE "E" BOX GIRDER TYPE, Serial #2145, 49'7" span, 25 foot lift, 28 feet per minute. 25 HP motor, 3 phase, 60 cycle, 220 volt, bridge motor 15 HP travels 300 F.P.M., trolley travel 3 HP motor 125 F.P.M. Overhead clearance 6'5". End clearance 9" each side. A.C. motor equipment. Condition good.

Price . . . $4,500.00 F.O.B. our plant

THE GLOBE COMPANY
4000 S. Princeton Ave., Chicago 9, Ill.

POSITIONS WANTED

GEAR SPECIALIST—12 years' experience with gear hobbers and threadmillers, who is capable of analyzing and correcting gear, tooling, and machine troubles desires position with gear manufacturer. Experienced in spline, spur, helical, and worm gearing; milling worms, threads, and leadscrews. PW-966, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

RECENT CONSULTING Engineer manufacturing procedures and methods. Excellent record of accomplishment in the design and development of products and the adoption of tooling and production facilities. Can organize and follow-up work to have it completed in a satisfactory and economical manner. PW-1016, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL ENGINEER and designer—experienced in manufacturing planning, cost reduction development work, tools, jigs, fixtures, estimating. 10 years' shop experience. PW-1206, American Machinist, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER, B.S. degree, six years' broad experience in equipment design, plant layout, material handling, production control, wage administration, and office procedures; head of plant Industrial Engineering department, nationally known company. Interested in applying an engineering ability with a small manufacturer in Northeastern, Northwestern, or Rocky Mountain States. PW-1193, American Machinist, 330 W. 42nd St., New York 18, N. Y.

YOUNG MAN—Age 18—technical education has 2 years' toolroom experience, wants to learn tool and diemaking ore design. Can supply references. What have you? PW-1150, American Machinist 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

DO YOU want an outlet for your machinery and equipment in the following territory: lower half of Ohio and Indiana. Have real live organization calling on machine tool builders, automotive trade and stamping works. We can handle a few additional items. We have excellent warehouse facilities. Main Post Office Box 111, Cincinnati 1, Ohio.

MANUFACTURER'S REPRESENTATIVE
In INDIA — BURMA

Well established representative desirous of contacting leading American manufacturer interested in representation and distribution in India and Burma. Excellent bank references.

P. K. PATEL & CO.
P. O. BOX 88, BARODA (INDIA) CABLES PIKE

SELLING OPPORTUNITIES WANTED

NEW ENGLAND sales representative, covering manufacturing plants. Specialize on parts for production; such as, bearings, castings, etc., on straight commission basis. Can handle one more good line. Address P. O. Box 838, Springfield, Mass.

DETROIT ENGINEERING Sales Organization with established office and warehouse offers responsible sales representation. Montgomery Engineering Co., 672 W. Hancock, Detroit 1, Michigan.

PATENT ATTORNEY

Patent and Trade-Mark Practice

before U. S. Patent Office Validity and Infringement Investigations and Opinions Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

FOR SALE
AUTO SCREW MACHINE

One 1" and 1⅝" 6 Spindle Greenlee Automatic Screw Machine. Late Model, Good condition, may be seen in operation.

KAMINGA MFG. CO.
1444 CHICAGO DR., GRAND RAPIDS, MICH.

NEED MACHINERY FOR LIGHT METALS MANUFACTURING?

FARNHAM countersinkers, carriage drills, spar millers, forming rolls are known wherever light or heavy metals are fabricated.

Used machines are available at surplus centers. We can rebuild and guarantee them as new.

FARNHAM
MANUFACTURING COMPANY
1646 SENECA ST., BUFFALO 10, N. Y.

NEW SURPLUS TAPS FOR IMMEDIATE DELIVERY

¼—28 Greenfield High Speed Commercial Ground Gun Taps

Left Hand—25 dozen
Left hand precision ground—4 dozen
Right hand commercial ground—35 dozen

S. W. Card Mfg. Company High Speed Commercial Ground Gun Taps Spiral Point

Left hand—32 dozen—Right hand—34 dozen

All left hand taps $1.35 less 30%
All right hand taps 95¢ less 30% less 15%

THE W. H. REISNER MFG. CO., INC.
Hagerstown Maryland

THREAD GAGES — PLUG AND RING

Slightly used, NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.
Send For Our Bargain Circular

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

LATHES

10"x24" Logan Q.C.G. Lathes (new)
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
16"x6' American Motor Driven Lathe
16"x8' Monarch Geared Head Lathe
18"x10' American, Geared Head, Taper
18"x6' American Q.C.G. motor drive
20"x10" American Q.V.G. motor drive
20"x11' Schumacher-Boye, M.D.
24"x12' LeBlond Heavy Pattern
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head
20"x8' Lodge & Shipley, motor drive
24"x22' Lodge & Shipley, G.H.M. drive
24"x36' New Haven, M.D.

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

MULTIPLE DRILLS

Natco #12 Arranged for 20 spindles
Natco #D6, 24 spindles, M.D. late type
Natco #D5, 14 spindles, M.D. late type
Fox #15, 54 spindles, M.D.

GRINDERS

Blanchard #16 Vertical Rotary Surface Grinder, motor drive
Pratt & Whitney 14" x 36" Vert. Surface Grinder, motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

FOUNDRY MACHINES

2—#0 Johnson & Jennings, Jolt Squeezer Draw Pattern, 15"x21" Table
2—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23x38" Table
2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"
1—#602 Osborn Jolt Rollover and Pattern Draw, jolt cap. 900#, 36" flask length.
1—Tessmer, Sprue Cutter, 1¼" square, capacity

SHEARS & METAL WORKING

Lennox Splitting Shear, ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 8 Rolls
West Co. 36" x 10 ga. 15" gap, Power Squaring Shear

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1 Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
#8 Lees Bradner Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

BORING MILL

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36

RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm,11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford

SHAPERS — PLANERS

Fellows No. 6—36" Gear Shaper, motor dr.
24" American H.D., B.G., Crank Shaper, Direct M.D.
20x20x36 N.B.P. Shaper Planer
Whitcombe 24"x24"x6' Planer
1—New Haven, 12" Slotter (like new)
Gray 26"x26"x8' Planer
Betts 120" x 72" x 35' Metal working Double Housing Planer. Equipped with: 4 heads and power rapid traverse. With motor drive and controls, bed is 61' 3½" long

Pratt & Whitney 0" to 6" Vertical Shaper, swivel head on ram, rotary table—20" diam. Recently overhauled. Very good condition. Motor driven.

POWER PRESSES

2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. AAR, motor drive, 48" throat
Bliss #4¾ Dble. Crank Press, 5" shaft, 4" stroke
Bliss #76½B Single Crank Geared Press, 7" shaft, 3" stroke
Horton-Ackerly, Back Flywheel Bench Presses, ¾" & 1" stroke
Caldwell, 200 tons capacity, Hydraulic Horizontal Wheel Press
Lucas 15 ton Power Arbor Press
Bliss-Consolidated #163B S.S. Dble. Crank Press
Baxendale #4 O.B.I. Power Press, 2½" stroke

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MACHINERY COMPANY
Machinery Merchants

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MOREY

MODERN MACHINE TOOLS
LOW PRICES

BETTS (CONSOLIDATED) 100" Vertical Boring and Turning Mill, 2 swivel heads on cross rail, Timken Bearing table, with 40 HP main drive motor and electrical starting equipment, latest type.

NEARLY

BORING MILLS—Vertical

BETTS 120"—2 swivel head, motor drive
BETTS (Consolidated) 100"—2 heads, DC, Latest Type
BETTS (CONSOLIDATED) 84" 3-heads, AC Latest
BULLARD 36", New Era Type, M.D.
COLBURN 72" 2 swivel heads, AC, M.D.
KING 36" Turret, M.D., Latest Type
NILES 73", 100", 120", 2 swivel heads, PRT, M.D.

DRILLS—Radial

AMERICAN 3½'9"—Maxi-Speed, Motor Drive
AMERICAN 4'11"—5'13" AC, M.D.
AMERICAN 5', Univ., AC, M.D.
AMERICAN 7' Triple-purpose, M.D.
CARLTON 6'15", motor on arm
CINCINNATI BICKFORD 5'13", 6'15" AC, M.D.
CINCINNATI BICKFORD 6' Univ., AC, M.D.
DRESES 5'13", 4'13" AC, M.D.
FOSDICK 5'14", AC, M.D.
MUELLER 4½'9", 4'11" AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
WESTERN 3', 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber—latest
BARBER COLMAN Type S, #3, #12 Hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
CROSS #73 Univ., tooth-rounder, Latest Type
FELLOWS #7, 7A, 72, 75A, 77, 615A, 645A3 Gear Shaper, high speed, Latest Type
GLEASON 11", 18" bevel gear generator, M.D.
GLEASON #13 tester, M.D.
GOULD & EBERHARDT 36H, 96H Hobber, M.D. with differential
GOULD & EBERHARDT 12 H.S., Latest Type
HERCULES HOBBER, differential, M.D.
PRATT & WHITNEY 10" Grinder, hyd.—latest type
SCHUHARDT & SCHUTTE #1, #2, Hobber, differential, infeed, M.D.

GRINDERS—Cyl.—Plain & Uni.

BROWN & SHARPE #1, #3, #4 Univ., Latest
BROWN & SHARPE #5 Plain 3x12, LATEST
BROWN & SHARPE #20—plain—10x18—Latest Type
LANDIS 6"x18" Type C Hyd., Latest Type
LANDIS 30x220" Centers, Plain, M.D.
NORTON 14x36 Type "C", Universal, Hyd., Latest
NORTON 10x18 Plain—motor drive
NORTON 16x72 Plain Type C—latest type
NORTON 16x72 Type C, Universal, Hyd., Latest

GRINDERS—Internal Cutters & Miscellaneous

BROWN & SHARPE #13, Universal Tool, Latest Type
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5, Internal, hyd., latest type
CINCINNATI #2, #4 Centerless, Latest Type
HEALD 72A3 Sizematic internal, latest type
HEALD 72A5 plain internal, latest type
HEALD #81, Sizematic, Gagematic, Latest Type
HEALD 75A Plain, Internal, Latest Type
PRATT & WHITNEY Contour Cutter—latest type
THOMPSON 6x48 auto. Broach Grinder, Hyd., Latest Type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER 8" Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #16, 26" chuck, Motor Drive
BLANCHARD #27, 18, M.D., Latest Type
HEALD #22, 12" Rotary, Latest Type
MATTISON 12x16x48 Hyd., Latest Type
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type
THOMPSON 8x12x24 Type B, Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 3B, M.D., Latest Type
PRATT & WHITNEY 2A, M.D., Latest Type

LATHES—Engine & Mfg.

BARNES #420, 2 spindle Deep Hole Borer
BETTS BRIDGEFORD 84x24' bed, AC, M.D.
BRIDGEFORD 36"x28', 36"x32' bed—2 carriages, M.D.
HENDEY 12x54" Centers, Engine, Latest Type
HENDEY 14x8' bed, Engine, Geared Head
KEIGHLEY LIFTS 8x16x4', Gap, AC, M.D.
LODGE & SHIPLEY 16/20"x30" centers, Timken Bearing Latest Type
LeBLOND 13x4', 17x5', 17x14' bed, Timken Bearing, Rapid Production, Latest Type
LeBLOND #2 Deep Hole Borer, Timken, Latest
LOSWING 4x60, 4x84, 8x60, 8x84, 8x108, 5x34 Timken Bearing, Latest Type
MOREY MATTHEWS, Shaft Turning, Latest Type
NILES 36x24' Centers, Time-Saver, Timken, PRT, Latest Type
NILES 42 x60", double head Motor Drive
NILES 48x23', 32', 34', 35', Centers, heavy duty, Timken Bearing, PRT, Latest Type
NILES 60x10', 15', 35', 40', Centers, heavy duty, Timken Bearing, Latest Type
NILES BEMENT POND 72"x62' Centers, combination Boring and Turning, heavy duty, Motor Drive
NILES 30x50' Deep Hole Borer, Timken, Latest
PITTSBURGH 50"x30' bed—M.D.
PRATT & WHITNEY 2½B 50", 2 spindle, Latest
REED PRENTICE 24x20' bed, AC, M.D.
WARD HAGGAS & SMITH 18x30x10' bed, Gap Lathe, AC, M.D.

AUTO. SCREW MACHINES

ACME GRIDLEY Model RA-6, 2", Latest Type
BROWN & SHARPE #4 Highspeed, 1½" cap., Latest
CONOMATICS 3½" 4 spindle—latest type
CONOMATICS 2⅝"—6 spindle, Latest Type

BORING MILLS—Horizontal

DETRICK & HARVEY 4", 5" bar, floor type, M.D.
LANDIS #35—3½" bar—floor type
NILES BEMENT POND 5", 6", 7" bar—floor type
NILES BEMENT POND 4½" bar, M.D.
P & H #10 3½" bar, floor type, M.D.
UNIVERSAL #3A—3" bar, Motor Drive

DEPENDABLE MACHINE TOOLS • PROMPT SERVICE

ALL BUILT SINCE 1941

LATHES—Turret

BARDONS & OLIVER #5, #7 Timken, Latest
CINCINNATI ACME #1, #5W, Timken bearing, latest
GISHOLT #3D, 8D, Simplimatic, Timken, Latest
GISHOLT #3, #4, #5 Univ., Timken Bearing, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing latest type
JONES & LAMSON #3, 7C, 8A, 9A, Universal, Timgen Bearing, Latest Type
LIBBY #1H-5 Timken Bearing—latest 5⅛" hole
MOREY 2G, #3, #4, Timken Bearing, latest
WARNER & SWASEY #2, 3, 4, 5, Universal, Timken Bearing, Latest Type
WARNER & SWASEY #3A, 4A, Universal 6" cap., bar and chucking, Timken Bearing, Latest Type

MILLING MACHINES—Mfg.

BRIGGS Type 2A, production, HYD., latest type
CINCINNATI 48", 24" duplex, automatic, SPD
CINCINNATI 3-24 Duplex, Hydromatic, Timken Bearing, Latest Type
INGERSOLL 48x42x16', 4 heads, Planer Type, AC, M.D.
INGERSOLL 32x24x16', 2 heads, Planer Type, AC. M.D.
MOREY #12M 2 spdle. Profiler & Milling Machine
TAYLOR & FENN M-80, Duplex Spline, Latest Type

MILLING MACHINES—Plain

BROWN & SHARPE #000 Timken Bearing, Latest,
BROWN & SHARPE #12 auto., Timken, Latest
CINCINNATI #2, 3, Dial Type, Timken Latest
CINCINNATI #4, 4S, 5 Timken Bearing, Motor Drive
CINCINNATI 0-8 Plain, auto, Timken Bearing, Latest Type, rise and fall
CINCINNATI 4-36 Hydromatic, Latest Type
KEARNEY & TRECKER #3K, 4K, Timken, Latest
KEARNEY & TRECKER 1218 auto., Timken, Latest
KEMPSMITH #4 Maximiller—Timken—latest
NICHOLS, hand, Timken Bearing, M.D., Latest Type
OHIO 16x72" table, Timken Bearing, Latest
SUNDSTRAND #3 Rigidmill, Timken, AC, M.D.

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, 4, Dial Type, Timken Latest
KEARNEY & TRECKER 2K, 3H, 3K, Timken—latest
REED PRENTICE 3VG high speed with or without Detroit Hyd., Duplicator, Latest Type

PLANERS

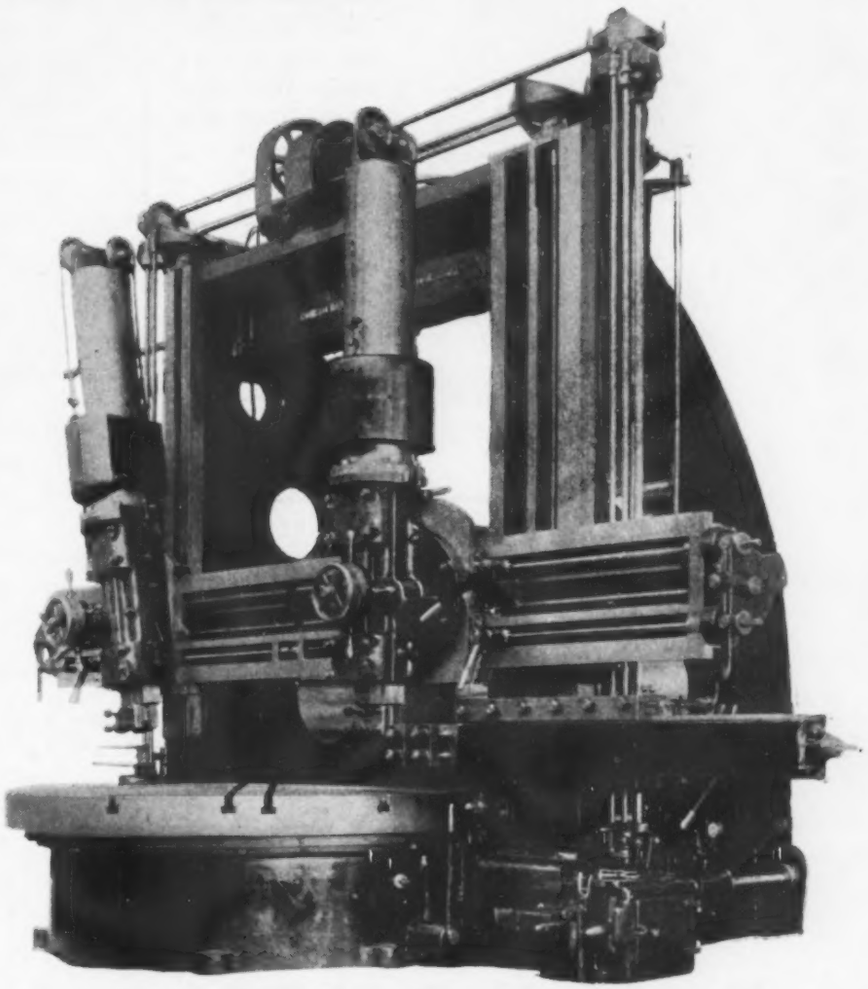
CHANDLER 36x36x20' 4 heads AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84x84x18', 4 heads, Box Table.
GRAY 36x36x16', 3 heads, DC, M.D.
NILES 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC

SHAPERS

COCHRANE BLY Univ. Vert. Shaper-Miller, M.D.
LAMAIRE 18' Vert. Hydraulic—latest type
MORTON 48" Draw-Cut, M.D.
MOREY 8", 10", 12", 14", Vertical Latest type

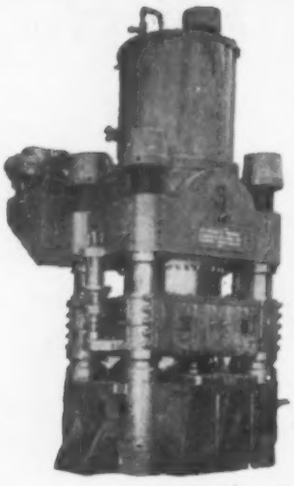
THREAD MILLING MACHINES

MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, Model "C"—Latest
PRATT & WHITNEY 6x20, 6x60" centers, Model C, Motor Drive, Latest Type



BETTS (CONSOLIDATED) 84" Vertical Boring and Turning Mill, 2 swivel heads on cross rail, 1 side head, with drum scoring attachment, with motor and electrical starting equipment.

Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited



H.P.M. 2000 ton fast traverse, HYDRAULIC PRESS. Bed 46½" x 67½". Stroke 12". Shut height 20¾" with pumps, motor, and controls.

No. 45 GIDDINGS & LEWIS, table type, BORING MILL, 5" Bar.

84" GISHOLT VERTICAL BORING MILL.

72" x 64" x 14' INGERSOLL PLANER TYPE MILLING MACHINE with 2 Vertical heads (1 head right angle) and 1 side head.

No. 5 REED-PRENTICE VERTICAL JIG MILLING MACHINE, table 68"x 16", motor drive

10" x 168"

PRATT & WHITNEY THREAD MILL

54"x18' HOUSTON STANWOOD GAMBLE Heavy Duty ENGINE LATHE with motor.

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875 W. 120th STREET **CHICAGO 43, ILLINOIS**

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30"x60" Monarch model NN Lathe, taper, 1944
#25A, 3¾" Defiance Horizontal Boring Mill, 1941
14"x60" Pratt & Whitney Hydraulic Vertical Surface Grinder, 1942
30—#2 Kent 6"x19" surface grinders, 1943
12"x36" Norton Multipurpose Universal Grinder, 1941
#11 Blanchard 16" Rotary Surface Grinder, 1941
#91A Covel Universal Tool & Cutter Grinder, 1942
24" Gemco Universal Shaper, PRT 1947
16" Cincinnati Universal Shaper, 1942
12" Smith & Mills Toolroom Shaper, 14" stroke, B.G. 1941
#2G Kempsmith Plain Miller, 1943
10"x10" Peerless Universal Shaping Saw, 1942
7"x7" Peerless Hydra-Cut Saw, 1942
2—8" Ames Precision Collet Lathes, 1942
150 ton Rodgers Vertical Hydraulic Shop Press, 1946

THE O'BRIEN MACHINERY CO.

113 N. 3rd ST. **MArket 7-4180** **PHILA. 6, PA.**

HEADLINERS

LATHES

14"x6' AMERICAN 12-speed Grd. Hd. Lathe, AC M.D. taper
14"x6' HENDEY Toolroom Lathe, Schulte Drive, univ. relieving attachment
16"x12' LODGE & SHIPLEY Selec. Grd. Hd. Lathe, AC MD, taper
20"x8' LODGE & SHIPLEY Selec. Grd. Hd. Lathe, AC MD

MILLERS

#2 MILWAUKEE Univ. Miller, SPD, DOA, Timken, PRT, Div. Hds.
#3 CINCINNATI Univ. Miller, AC MD, Div. Hds., Vert. Attach., Slotting Attach.
#4B MILWAUKEE Plain Miller, arr. MD, DOA, PRT
#3 CINCINNATI Med. Speed Dial Type Plain, Miller, AC MD, vert. hd. Miller.
#3 OHIO Rect. O.A. Univ., Miller, div. hds. vert. hd.

SHAPERS

24"x28" GOULD & EBERHARDT H.D. Shapers, AC MD

GRINDERS

#25A HAELD Rotary Surf. Grinder, AC MD
#72A2 HEALD "Sizematic" Internal Grinders, AC MD
#2 BROWN & SHARPE Univ. Grinder, arr. AC MD
#51 OLIVER Drill Grinders, AC MD

BORING MILLS

24" & 36" BULLARD "New ra" Vertical Turret Lathes, AC MD
48" Colburn Vert. Boring Mill, AC MD, PRT

MISCELLANIOUS

#3 BARBER-COLMAN Gear Hobbers, AC MD
EL-6 FERRACUTE OBI Press, AC MD, 93 tons
14" BETTS Crank Slotter, AC MD
Michigan Relieving Machine

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The Searchlight Section is at your service for bringing business needs or "opportunities" to the attention of men associated in executive management, sales and responsible technical, engineering and operating capacities with the industry served by this publication.

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DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

ENGINE LATHES

12"x6' Lodge & Shipley Grd. Hd., m.d. in base, taper
12"x6' Sidney Geared Head, m.d.
12"x84" centers Lodge & Shipley Selec. Head, m.d. in base, taper
13"x30" centers Pratt & Whitney Model B Geared Head, m.d. in base, taper
13"x48" centers Pratt & Whitney, as above
14"x6' bed American Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' Springfield Grd. hd., m.d. in base, taper
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d., taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x30" centers Monarch Grd. Hd., m.d. in base
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
20"x48" centers Monarch Grd. Hd., m.d. in base
20"x72" centers Monarch Grd. Hd., m.d. in base
19"x10' LeBlond Geared Head, m.d.
21"x12' LeBlond, cone
21"x13" LeBlond, cone
21"x18' LeBlond, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone, taper
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone
24"x10' Whitcomb-Blaisdell, cone
24"x12' LeBlond, cone
24"x12' Reed-Prentice Geared Head, taper
24"x14' American Geared Head, m.d.
24"x14' Boye & Emmes, cone
24"x20' Lodge & Shipley, cone, taper
25"x10' LeBlond, cone
30"x12'6" Niles-Bement-Pond, m.d.
30"x26' Lodge & Shipley Selec. Head, m.d.
36"x21' centers Putnam Geared Head, m.d.
36"x18' Lodge & Shipley Selec. Head, m.d., taper
36"x28'6" Niles H.D., m.d., latest
36"x36' bed Niles H.D., m.d., latest
36"x30' Lodge & Shipley Selec. Head, m.d.
36"x32' centers Putnam Geared Head, m.d.
50"x204" centers LeBlond H.D. Geared Head, m.d., taper, latest

KEYSEATERS

No. 1 Baker, belt
30" stroke Morton, m.d.

MANUFACTURING LATHES

No. 9H LeBlond MultiCut, m.d.
3½x36", 3½x80", 8x84" LoSwing, m.d.
4x60", 8x132" LoSwing, m.d., latest type
9x12" Sundstrand Mfg.
13x24" Coulter Automatic Threading, m.d.
13x96", 15"x6' Automatic Threading
16"x6' Cincinnati Mfg., m.d.
16"x6' LeBlond Rapid Production, m.d. in base
17"x6', 17"x8' LeBlond Mfg.
20"x8' LeBlond Mfg.
21"x8' LeBlond Turret
No. 4 R. K. LeBlond Boring Lathe, 37' bed, latest
Niles-Bement-Pond Quartering Machine, new

MANUFACTURING MILLING MACHINES

No. 00 Sundstrand Hyd. Feed Rigidmill, m.d., latest
No. 0-8 Cincinnati EA Plain Automatic, new, latest Type P Ohio Mfg., m.d.
No. 1-12 Cincinnati Plain Automatic, m.d.
No. 1-18 Cincinnati Plain Automatic, latest
No. 2-24 Cincinnati Plain Automatic, latest
No. 2-24 Cincinnati Plain Automatic, with rise and fall attach., latest
No. 3A Sundstrand Copy Rigidmill, m.d.
No. 3-24 Cincinnati Plain Hydromatic, latest
No. 3-36 Cincinnati Duplex Hydromatic
No. 34-36 Cincinnati Duplex Hydromatic with tracer control, latest
No. 4-48 Cincinnati Plain Hydromatic, latest
18", 24", 28", Cincinnati Plain Automatic
24" Cincinnati Duplex Automatic, m.d.
48" Cincinnati Duplex Automatic
No. CT-36, CT-54 Lees-Bradner Thread Millers, latest
Hall Planetary Thread, m.d.
4" Pratt & Whitney Spline, m.d.
4½x12", 6x14", 6x20", 6x48", 6x80" Pratt & Whitney Thread
10x24" Hanson-Whitney Thread, m.d.
30"x30"x12' Ingersoll Slab, m.d.
36"x24"x8' Ingersoll, m.d.

HAND MILLING MACHINES

No. 1 United States, m.d.
No. 2 Productomatic, m.d.
No. 3 Garvin, m.d.

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d. in base
No. 1M Cincinnati, m.d.
No. 1½, 2 Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, latest
No. 2L Cincinnati, m.d. in base
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2MH Cincinnati, m.d. in base, latest
No. 3S, 4 Cincinnati H.P., m.d.
No. 4B, 5B Heavy Brown & Sharpe, m.d.
No. 5 Cinci. H.P., rect. overarm, Timken, latest
No. 5 Cincinnati H.P., m.d.
No. 5 Heavy LeBlond, s.p.d.

UNIVERSAL MILLING MACHINES

No. 2 H.D. LeBlond, cone
No. 3S Cincinnati, m.d.
No. 4A Brown & Sharpe, m.d.
No. 4G LeBlond H.D., s.p.d.

VERTICAL MILLING MACHINES

No. 2, 3, 4 Cincinnati High Speed Dial Type, latest
No. 2, 3, 4 Cinci. Medium Speed Dial Type, latest Cincinnati Hydromatic, m.d.
No. 2, 3, 4 Cincinnati High Power, m.d.
No. 2H, 2K, 3K, 4H, 4K Mil. Dial Type, latest
No. 2M Cincinnati, m.d.
No. 2½, 3B Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest type
No. 6 Becker, cone
No. 36V Van Norman, m.d.
No. 28-60 Cinci., 2 spindle Hydro-Tel, m.d., latest

HAMMERS

200 lb. Beaudry, m.d.
1100 Bement-Niles Single Frame Steam

PLANERS

P10 Coulter Crank Type Shaper-Planer, m.d.
30"x30"x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x16' Gray, 2 heads, belt, m.d.
36"x36"x18' Niles-Bement-Pond, reversing m.d.
36"x36"x20' Gray, 2 heads, belt
36"x36"x20' Cincinnati, 2 heads, belt
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, belted m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.

SAWS

7½ H.P. Cincinnati Elec. Tool Co. type JCAW Abrasive Cut-off Machine
No. 3 and 8 Nutter & Barnes Cold Saws
No. 6 Cochran-Bly Cold Saw
No. 138 Espen-Lucas Cold Saw, m.d.
28" Wagner Cold Saw, m.d.

SHEET METAL MACHINERY

No. 4 Hilles & Jones Straightening Rolls, cap. 1" plate 8' long
120" No. 100 Niagara Heavy Production Folder, 16 ga. cap.
No. 2 Campbell Nibbler, m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, reversing m.d.

TAPPERS

½" Rickert & Shaffer Vertical, belt
No. 2 Bakewell Precision, m.d., latest
No. 5 Webster & Perks 5 spindle Vertical Nut, belt

DISC GRINDERS

No. 4 Gardner, m.d.
No. 20 Gardner Combination, m.d.
7½ H.P. United States Elec. Tool Co. new
7½ H.P. Standard Elec. Tool Co. new

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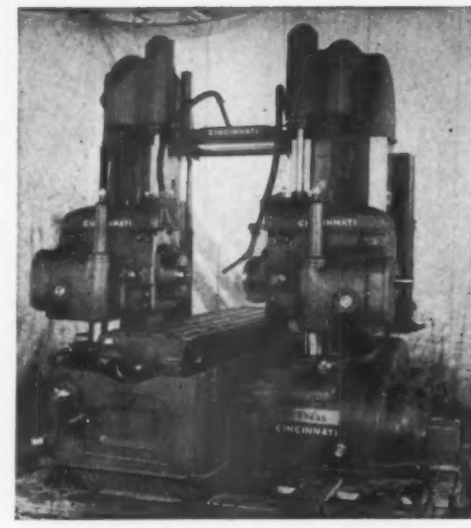
36" BULLARD Vert., M.D.
3½" bar GILBERT Table Type Horiz., M.D.
#25-C DEFIANCE Table Type, M.D.
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.

GRINDERS

#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P & W Hyd. Gear Grinder, M.D.
#5 B & S Plain Grinder, M.D.
10"x72" HILL-CLARKE (Norton) Grinder, M.D.
#11 BLANCHARD Rotary, 16"x20" chucks.
30"x24"x16' MATTISON Surface Grdr., M.D.

LATHES

12"x30" LODGE & SHIPLEY G.H. Lathe, M.D.
14"x30" LODGE & SHIPLEY G.H. Lathe, M.D.
12"x30" MONARCH Model "C" Lathe, M.D.
32"x324" centers LEBLOND LATHE, T.A., M.D.
42"x61' centers AMERICAN "SUPER PRODUCTIVE," M.D.
50"x17' centers LEBLOND "BIG SWING" Lathe, M.D.



#5/60 CINCINNATI, Duplex Hydromatic Milling Machines, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., one machine used six months—one new—never used.

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#3G HENDEY All Geared Univ., M.D.
#2G KEMPSMITH All Geared Univ., M.D.
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#3MS CINCINNATI Dial Type, Vert., M.D.
#3HS CINCINNATI Dial Type, Vert., M.D.
#4 CINCINNATI "HI-POWER" Vert., M.D.
#5H KEARNEY & TRECKER Plain, M.D.
#1H-12 KEARNEY & TRECKER MFG., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

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3'11" AMERICAN "HOLE WIZARD," M.D.
6'17" FOSDICK "ECONOMAX" M.D.

TURRET LATHES

#0 B & S Wire Feed Screw Machines, M.D.
#3 W & S Ram Type Univ., M.D.
#4 W & S Ram Type Univ., M.D.
#3 J & L Ram Type Univ., M.D.
#5 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Sadle Type Univ., M.D.

MISCELLANEOUS

32" OHIO Heavy Duty Shaper, M.D. (1942)
6"x48" THOMPSON Broach Grinder.
#36BM GOULD & EBERHARDT 3-spdle Gear Rougher
#4½ BLISS S.S. Double Action Press, M.D.
3/16"x96" CHICAGO Power Squaring Shear, M.D. (1942).
1½" Double Head LANDIS Threading Machine, M.D.

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MACHINE TOOLS

42" Bullard Spiral Drive Vertical Turret Lathe

#4K Milwaukee High Speed Plain Miller

#1248 Milwaukee SIMPLEX Bed Type Plain Miller

#2-18 Cincinnati Automatic Millers

#3 Cincinnati Vertical Miller

B4B NATCO 48-spdl. Holesteel Drill

#2, #3, #4, #5 Warner & Swasey Universal Turret Lathes

#2 Barber Colman Precision Gear Hobbers

8" x 48" Jones & Lamson Thread Grinders

ALL LATEST TYPE MACHINES

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No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 10 H.P. motors and controls, forced feed lubrication. 21x27 bolster 4½" stroke. In both Single and Double Action Models. Like new 110 strokes per minute.

No. 6 BLISS 90-125 Ton Capacity, straight side Punch Press, late model. With scrap cutters, double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke. In both Single and Double Action Models. Like new. 30, 88 or 100 strokes per minute.

1—#87 BLISS Press, 175 Ton cap. 32" stroke, late model.

SPOT WELDERS IMMEDIATE DELIVERY 5-300 KVA, Brand new. Guaranteed.

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2—PUTNAM 42"x34' Bed. Motor Driven (One with taper attachment)

4—LEBLOND 36"x32' Bed Motor Driven

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No. 3 Abrasive Surface Grinder, M.D.
14"x6' Rockford Lathes, M.D.

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2—Gardner #86—30" Lapping Machines with 5 H.P., 440 volt A.C., 3 phase, 60 cycle motors with magnetic brakes. Used very little and in excellent condition. Price $475.00 each.

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POTTSTOWN, PENNA.

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS ENGINEERED REBUILT

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BORING MILLS

9" Bar BETTS Horizontal floor type, 50" face plate 6'—vertical travel, modern, 4-motors.
3" Bar Universal TRI-WAY Horizontal, P.R.T.
3⅛" Bar No. 32 GIDDINGS & LEWIS.
4½" Bar N.B.P. Table type.
24" New Era, BULLARD
54" COLBURN, two heads.
12' BETTS Extra Heavy double drive.
14' BETTS, Heavy, late type
16-24' NILES-BEMENT-POND, Extension Type, two swivel heads. AC or DC.
16' NBP 2 swivel heads.

LATHES

18" x 10' AMERICAN 8-speed G.H.
24" x 13" AMERICAN 12-speed, G.H.
25" x 10' LEBLOND G.H.
27" x 22' REED PRENTICE G.H.
30" x 18' AMERICAN 12-speed, G.H.
36" x 40' AMERICAN 16-speed geared head.
42" x 34' LEBLOND late type, 27-speed, G.H.
48" x 40' SIMMONS, geared head.
48" x 45' NILES, 16-speed, G.H.
60" x 27' NILES, 24-speed, G.H.
90" PUTNAM Driving Wheel Lathe, journal truing.
3-AL GISHOLT, Hardened Ways.
27" No. 2H-8 LIBBY, Hardened ways.

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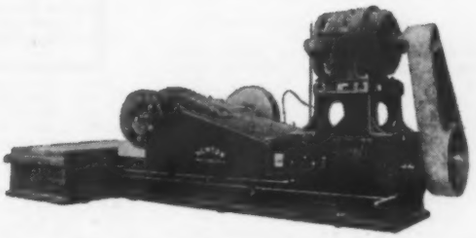
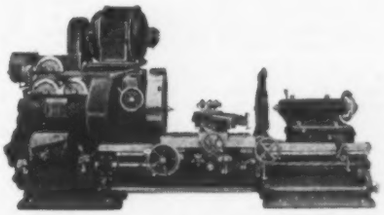


60" NEWTON Cold Saw Cutting-off Machine, capacity: Round 20"; Square 18"; Travel of Saw Carriage 34"; AC or DC motor drive.



36" x 40' (32' Centers) AMERICAN 1-Speed Geared Head Lathe, AC or DC motor drive.

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ENGINEERED Machine Tool REBUILDING

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3½" Cincinnati Gilbert Horizontal Boring Mill. Floor Type.

PRACTICALLY NEW

ONE YEAR ACTUAL SERVICE

***Price*.....$7750.00**

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Indianapolis, Indiana

LATE TYPE TOOLS

#2MH Cinci. Univ. Miller 1944
#3SP Van Norman Miller 1942
Nos. 2, 3, 4, Cinci. Vert. Miller '42, '45
#2, 3, 4 & 5 W. & S. Univ. &
#3 J. & L. Univ. Turret Lathes
#712 Fellows Gear Generator, 1942
36H & 48H G.&E. Gear Hobbers
30" x 15' centers Amer. Super Pro. Lathe
18" raised to 24½" x 192" centers, BB Model Monarch, Carr. P. R. T., '42

BENNETT MACHINERY CO.
30 Church St. N. Y. 7, N. Y.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

MONA MEMBER **B. D. BROOKS, INC.**
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UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drills, 21" Royersford Bk Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindles
Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
Gear Cutter, Brown & Sharpe #2—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer, 24"x24"x6' Pease motor drive
Punch & Shear, two ⅛" & ⅜" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
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LATE TYPE MACHINE TOOLS

1—#30 Fosdick Jig Borer with micrometers, indicators, 18" rotary table, telescoping gages, and large quantity of tools.
1—#2-H South Bend 16x6 Turret Lathe.
3—#EMS Hardinge Precision Turret Lathes.
1—#1 Brown & Sharpe Universal Grinder.
2—#2 Kempsmith motor driven Milling Machines.
1—150 ton Rodgers Hydraulic Arbor Press (new).
1—#5-60 — Cincinnati Duplex Milling Machine.
1—16x72 Norton Cylindrical Grinder.
1—#2-K Kearney & Trecker Vertical Milling Machine.
1—#4-K Kearney & Trecker Vertical Milling Machine with rotary table.

All Machinery Advertised Subject to Prior Sale

REYNOLDS Machinery Company

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QUALITY *Machine Tools*

NOW IN STOCK

28" x 60" CINCINNATI Vertical Hydrotel Milling Machine: Single spindle, with profile tracing attachment, motor driven. Latest model.

14" x 16" x 60" MATTISON Surface Grinder: Motor driven, with hydraulic table traverse, coolant equipment. Latest model.

AUTOMATICS

★ **9/16" RA-6 Acme-Gridley Automatic Screw Machines. Bar equip. New in 1943.**
2⅝" RA-6 Acme-Gridley, New in 1943.
1½" & 1⅝"—8 Spindle Conomatic, New in 1942.
5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILLS

No. 31 Lucas Horizontal, m.d.

BROACHES

LaPointe CPC 24, Hyd., Vertical. New in 1945.

DRILLS

★ **28" Cincinnati-Bickford Super Service Drill, box column type, with flanged quill unit, motor driven. Latest model.**
4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42" Cincinnati-Bickford.
★ **No. 3B-12 Edlund, four spindle, back gear and semi-auto. power feed, m.d. New 1944.**
★ **No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.**
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS

No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.
★ **No. 3616 Cleveland Rigidhobber, spur or spiral gears to 42" diameter x 10" face, m.d. New in 1943.**

GRINDERS

No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Intern. Grndr.
No. 72A3 Heald Gagematic Intern. Grndr.
6 x18 Cincinnati Cylindrical. New in 1943.
10 x 36 Norton Cylindrical. New in 1942.
No. 13 Brown & Sharpe Universal & Tool.
★ **No. 2 and No. 3 Cincinnati Centerless Grinders, with Filmatic Spindle, some with through feed rest, others with in-feed; m.d. New 1940-1941.**
★ **Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.**

LATHES, ENGINE

10" x 20" Monarch EE Toolmakers Lathe. Latest model.
12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
★ **22" x 72" Monarch CM Lathe, flame hardened ways, anti-friction taper attachment. New in 1944.**
24" x 12' Monarch helical, g.h.
48" x 12' Lodge & Shipley, c.d.
IMP and LR LO-Swing Lathe, m.d.
15" x 30" Lipe Carbo-matic. New in 1943.
17" x 50" LeBlonde Production, m.d. New in 1942.

LATHES, TURRET

No. 4A Warner & Swasey, g.h. New '42.
No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h. New '43.
No. 4 Gisholt, Univrsl., g.h. New in 1943.
No. 3 Warner & Swasey, g.h. New 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
36", 42" Bullard VTL, New Era.

MILLS

No. 26 Van Norman, ram type, swivel head, new in 1943.
No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 4B Brown & Sharpe Plain, m.d.
No. 2 MH Cincinnati Plain, m.d.
No. 2 H Milwaukee Vert., motor in base.
No. 2 Cincinnati Vertical, motor in base, new in 1943.
No. 2209 Milwaukee Mill, table 22"x158".
No. 3-36"Cinci. Hydromatic Duplex, m.d.
No. 56-72" Cinci. Hyd. Duplex Milling Machine.
No. 6 Whitney Hand Mill.
Nichols Hand Mill, coolant equipment. New in 1943.

PLANERS AND SHAPERS

16" Gould & Eberhardt Crank Shaper.
★ **6" Pratt & Whitney Vertical Shaper.**
No. 14 Cochrane & Bly Vertical Shaper.
36" x 36" x 12' Liberty Planer, 2 heads, box table.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. M.D.

MISCELLANEOUS

Relieving Attachment and 6 to 1 Subheadstock for Monarch 12" to 16" lathe. New and unused.
No. 748S Walker Magnetic chuck, 7" x 48" swivel type, new and unused.

(Approved Dealer for War Assets Administration Surplus Machines)

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EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-225 D. MEXICO, D.F.

QUALITY TOOLS

AUTOMATIC

16"x33" Fay with air operated tailstock. New 1942.

ENGINE LATHE

20"x72" centers American Pacemaker. Taper attachment, collets, 2 chucks, pan & pump. Built 1946.

BORING MILL

4¾" bar, No. 300 Giddings & Lewis, floor type Vertical travel 62", horizontal travel 132", feed of bar 40" Has outer support and bed plate.

PLANER

96"x48"x12' Liberty with 2 rail and 1 side head. Has power rapid traverse, forced feed lubrication and variable voltage drive with MG set.

BROACH

No. HP50 Lapointe hydraulic with extension broach support. 25 ton capacity, 72" stroke. Built in 1940.

SENSITIVE DRILL

24" Allen 3 spindle No. 3 type VCPF with power feeds and back gears. New 1942.

TAPER SPLINE HOBBER

Type T Barber Colman wth long overarm with support at rear for long work. For splines or gears. New 1944.

CENTERLESS GRINDERS

Nos. 2 & 3 Cincinnati with Filmatic bearings, hydraulic profile truing. Built from 1940 to 1943.

CYLINDRICAL GRINDERS

6"x18" No. 10 Brown & Sharpe electric-hydraulic. Three have oscillating attachment.
New in 1941 and 1942.

SURFACE GRINDERS

6"x18" & 10"x24" Norton hydraulic. New 1942.

TURRET LATHES

Nos. 3, 4 & 1L Gisholt. Built from 1942 to 1944.

VERTICAL TURRET LATHE

36" Bullard, spiral geared, built 1942. Also 24", 36" & 42" New Era type.

PLAIN MILLERS

No. 3 High Speed & No. 4 Medium Speed Cincinnati dial type horizontal. New in 1942.

MANUFACTURING MILLERS

No. 2-24" Cincinnati automatic. Nos. 3-36, 4-36, 4-48, 5-48, 5-60 and 5-80 duplex Cincinnati Hydramatic. Built from 1942 through 1944.

VERTICAL MILLERS

Nos. 2M, 2, 3, 4 & 4 High Power Cincinnati
Nos. 2H, 3H & 4H Kearney & Trecker. Built 1942 to 1944.

PRESS

1000 Ton No. 666 Toledo knuckle joint coining with 4½" stroke and Farval lubrication.

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MILES MACHINERY CO.
SAGINAW, MICH.

STOCK TOOLS — *Prompt Shipment*

AUTOMATICS, 3½" Cone 4-Spindle (4)
AUTOMATIC, 1⅞" Cone 4-Spindle (2)
BOLT CUTTER, No. 22 Murchey, Dble. Hd.
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal.
BORING MILL, Hor. 3½" Landis, Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 40" King, 2 heads, M.D.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 5 Abrasive, 14"x48".
GRINDER, Surf. Hyd. G & L, 14"x18"x72"
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Beard Drop, 1,000#, B. & S.
HOIST, Monorail, 3 ton, Detroit, D.C.
LATHE, 24"x16' B & E Grd. Hd.
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain, No. 3 Milwaukee, S.P.D.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MULT-AU-MATICS, Bullard Type A, 6-Spdle.
PUNCH & SHEAR, No. 2 Kling, ⅛"-½", 24" thr.
PUNCH & SHEAR, "C" L & A, 2½"-1½", 72" thr.
PLANER, Openside, 36"x36"x12' Cleveland
SHAPER, 32" Gould & Eberhardt, M.D.

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No. 2A JIG BORER
with ATTACHMENTS

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Belt Cutter, 1"-1¼"-2"-2¾"-4" Acme, Landis.
Boring Mills, 24"-36"-42"-52"-72"-96".
Drills, Radial 6' Cin.-Bick. 5' Carlton.
Lathe, Turret 3-A W. & S., B. P. D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

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12"x21" Fay Automatic (1942)
12"x18" Lipe Carbo, Motor Drive
18"x6' American Grd. Hd.
20"x10' Lodge & Shipley
20"x48" Centers LeBlond (1945)
22"x48" Centers Monarch (1942)
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head
50"x17'cc LeBlond

MILLING MACHINES

No. 2K Milwaukee Plain (1941)
No. 4 Cincinnati Plain
No. 4 Cincinnati High Power Plain
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. Dial Type
No. 3 Cincinati Vert. High Power
No. 3K Milwaukee Vertical
No. 118 Van Norman Production, 18" Feed
24" Cincinnati Production
No. 27-MB Smalley-General Thread
No. 2 Hanson-Whitney Thread
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
26"x25"x12' Ingersoll Adjustable Rail
60"x48"x12' Ingersoll Adjustable Rail

DRILLS

No. 121 Baker, Motor Drive
28" Cinn.-Bickford
No. D-8 Colburn No. 6 M. T.
No. 2 LMS—26"—1 Spdl. L-G (1944)
No. 3 MS—24"—1 Spdl. L-G
No. 2 LMS—20"—2 Spdl. L-G (1944)
No. 2 LMS—26"—2 Spdl. L-G (1945)
No. 2 LMS—20"—3 Spdl. L-G (1943)
No. 2 LMS—14"—4 Spdl. L-G
No. 4 BM—24"—4 Spdl. Fosdick
No. 2 LMS—26"—4 Spdl. L-G
No. 2 LMS—26"—6 Spdl. L-G
No. 2—8 Spdl. Leland-Gifford
6'-15" Col. Cinn.-Bickford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
72" Cincinnati
72" Niles Extra Heavy

HOR. BOR. MILLS

No. 31—3" Bar Lucas
No. 25C, 3¾" Bar Defiance, Table Type (1942)
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

GEAR MACHINES

No. 3 Barber Colman (1943)
No. 7 Fellows Gear Shaper
11" Gleason Bevel Gear Cutter
No. 7—100" Newark

PLANERS

36"x36"x12' Cincinnati, 4 Heads
42"x36"x12' Cincinnati

PRESS

2500 Ton Lake Erie hydraulic
No. 314 Bliss Squaring Shear

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Jones & Lamson (1942)
No. 3 Warner & Swasey, bar feed (1940)
No. 5 Warner & Swasey (1941)
2-A Warner & Swasey (1943)
No. 1A Warner & Swasey, Preselector (1942)
18" Libby, 3½" H.S.

GRINDERS

No. 5 B. & S. Plain (55x18")
4"x18" Landis Plain
10"x72" Colonial Broach Grd.
10"x24" Landis Universal
12"x36" Landis Univ. Type LCH (1945)
12"x48" Cincinnati Univ.
No. 22—12" Heald Rotary Surface
No. 5 Abrasive Surface Grdr.
No. 34 Abrasive Surface Grdr.
Norton Motor Driven Grinders, sizes 6x18 to 24x240

Approved WAA Dealer CHI-9

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¼" to 1¼" by 32nds. 33 Reamers in Wooden Box.
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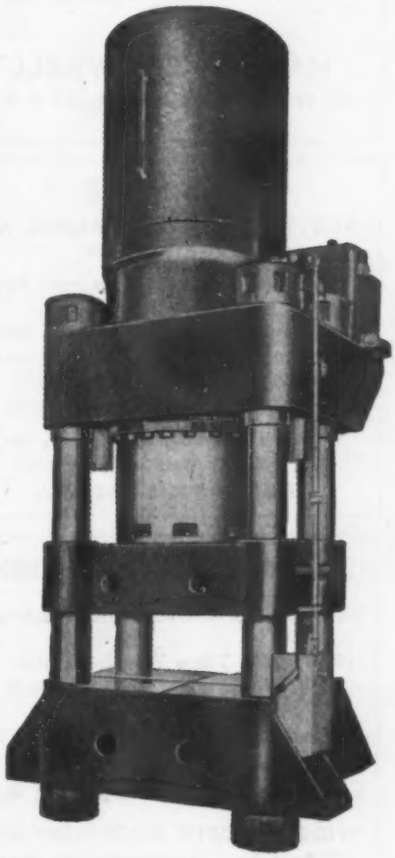

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Platen size 48"x42". Stroke 22". Opening 37. Ram Diameter 35". Driven by 50 H.P. Motor, *Also*

600 TON ELMES PRESS

Self contained 48x45" between rods, 36" stroke, 66" openings, 75 H.P. motor, 3 phase, 60 cycle, 220v.

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Aaron Machinery Co.

Incorporated
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Specials
Pratt & Whitney No. 2A Jig Borer
Gorton Duplicators and Vert. Millers
Gorton No. 3Z engraving machines
Milwaukee No. 2HL, B. & S. No. 2 Vert, swivel head
Doall Surface Grinder with Selectron

BORING MILLS

#0 Giddings & Lewis arr., M.D.
2½" Cleveland arr. M.D.
2½", 4" Binsee
Niles-Bement-Pond 4" duplex Universal 3"
66" Niles; 54" Colburn, M.D. 2 hds.

TURRET LATHES

W. & S. Nos. 3, 4, 5 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36", #3.
24", 42" Bullard "New Era" Vert., M.D.
Acme #2 M.D.

GRINDERS

#25 Gallmeyer & Livingston
#25A Heald, M.D. like new.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10 11 Cyl.; 1, 3 Univ.
Norton 6x18" Hyd. Surface, M.D.

LATHES

16"x8', 10"x3' South Bend, M.D. Late.
Monarch, Hendey 12x30 geared head, Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey, Taper, Collets
9" LeBlond, P&W Auto.
36x30' Putnam M.D., 36x22'
32"x35' Wickes, M.D.
Putnam 42x16', M.D. S.C.G.
20"x19', 20"x30' Boye & Emmes Grd. Hd., LeBlond "Regal" 16"x12', Grd. Hd., M.D.

AUTOMATICS

Cleveland Model A ⅞", 1¼", 2"; B 1", 2"
⅞" Cone 4 spindle, Gridley
B & S #0, No. 2 Hand Screw

New In Stock—Power Shears 52" and 72"
Spot & Arc Welders
5, 9, 14, 18 & 30 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
8" Shape-Rite Shapers
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw
20 ton Northern Hydraulic Presses

RADIALS

4' Fosdick 13" col., 8' Carlton, 19" col.
4', 5' 6' American Triple Purpose

MILLING MACHINES

Cincinnati No. 1/18 Mfg. late.
9J Gorton Vert., M.D., Duplicator
No. 1 Cleveland Vert., M.D.
#12, #22L Van Norman Univ.
#2B K & T Univ.; No. 2-2A B & S Univ.
#2HL Milwaukee, M.D. late
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
K. & T., B. & S., No. 2, 3
B. & S. No. 1, 3, Vert.
B & S #12 Elec. Prod. late type

MISCELLANEOUS

Marvel #6A Hack Saw Auto. feed
Buffalo #0 Angle Roll, M.D.
#20 Bliss OBI, #58-OB Power Presses
Gorton No. 1S Engraving Machine 3Z, 3U
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6"
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
No. 236, 272 Niagara, Pexto 6' Power Shears
Cincinnati 20" shaper, like new.

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New York 12, N. Y.

WE DECLARE SURPLUS THE FOLLOWING MACHINES

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Model RA-6 six spindle Acme-Gridley Automatic, including tooling and equipment, Serial No. 22377A.—Practically new..$2450

No. 2 Cincinnati Centerless Grinder in excellent condition—Practically new.. 2250

Cincinnati-Bickford 5 ft. x 13" Radial Drill —Practically new..... 5900

Model BN-69900 Table Blast, Serial No. A-46690, mfd. by the American Wheelabrator Corporation—Practically new.. 4225

Model #162 Bliss Power Punch Press, about 35 ton capacity, 4" stroke, complete with 3 H.P. motor and magnetic starter—practically new..... 1050

Model #5012 Bliss Power Punch Press, about 90 ton capacity, 8" stroke, complete with 10 H.P. motor, bed area 13"x52"—Practically new..... 2725

Model #3 Waterbury Farrel Power Punch Press, about 20 ton capacity, 2½" stroke, bed area 10¼"x14¼"—Practically new 575

Model #6600 Waterbury Farrel Power Punch Press, about 55 ton capacity, 6" stroke, bed area 10"x45", complete with 5 H.P. motor, push button switches—practically new..... 1750

Schutte & Koerting Tilting Type Tumbling and Washing Barrels, 24" deep, 28" wide inside dimensions, bronze-lined, V-belt motor drive with A.C. motor for tilting barrel, A.C. motor for rotating barrel, push button controls. New in 1942..... 450

Cleveland Automatic Screw Machine, 3¼" capacity—Old machine..... 250

Gridley Automatic screw machines, 3" capacity—Old machine..... 200

Hendey milling machine, quick change feed gear, table size, 9½"x30", back geared belt drive—Old machine..... 175

18" Cincinnati miller, table size 9¼"x34", flat belt drive, table travels horizontal, adjustable head—Old machine..... 175

#5 Waterbury Farrel Blanking and Cupping Press..... 450

Milwaukee Model 104 Portable Moulding Machine 300

Model #57 Multigraph Machine..... 200

Assorted motors 1/6 HP. to 20 HP. 220/440 V. 60 Cycle, 3 Phase.

BILLARD MACHINE & TOOL COMPANY
Mansfield, Penna. Phone 44

24" Bullard Vertical Turret Lathe
24" x 24" x 6' Gray Planer
5'-14" Fosdick Radial
3'-9" Cincinnati-Bickford Radial
#2 Acme Full Universal Turret Lathe
#1 Acme Semi-Universal Turret Lathe

OLDER MACHINES, in good working condition

HAZARD BROWNELL
350 Waterman St., Providence 6, R.I.

FOR SALE

NEW YODER POWER HAMMER AT BARGAIN PRICE

Model K-90-M Pedestal Type with large quantity of new dies.

THIS MACHINE HAS NEVER BEEN USED

NET PRICE.....$1,250.00

COMPLETE WITH MOTOR AND DIES

IMMEDIATE SHIPMENT FROM STOCK

WINSTON MACHINERY CO., Inc.
517 South Delaware Street
INDIANAPOLIS, INDIANA

LATE MODEL TURRET LATHES

3—#0 B & S Wire Feed Screw Machines, M.D.
14—#3 W & S Ram Type Univ., M.D.
1—#5 W & S Ram Type Univ., M.D.
3—#3 J & L Ram Type Univ., M.D.
1—#5 J & L Ram Type Univ., M.D.
3—#1A W & S Saddle Type Univ., M.D.
1—#2A W & S Saddle Type Univ., M.D.

WIGGLESWORTH MACHINERY CO.
200 Bent St. Cambridge 41, Mass.

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this Searchlight Section of

AMERICAN MACHINIST

is an index of reliable sources for Used and Surplus New Metal Working Equipment now available. Consult the *Searchlight Section* in following issues for later offerings.

If you don't see what you want—ask for it. Ask the advertiser. Dealers are constantly adding to their stocks and may have acquired just what you need. Or, shall we ask them for you?

And, when you have special items to dispose of, dealers will be glad to know of it; or you can use this Searchlight Section to contact user—buyers direct, if you prefer. Send a list of your equipment and we will gladly give full information as to space and rates.

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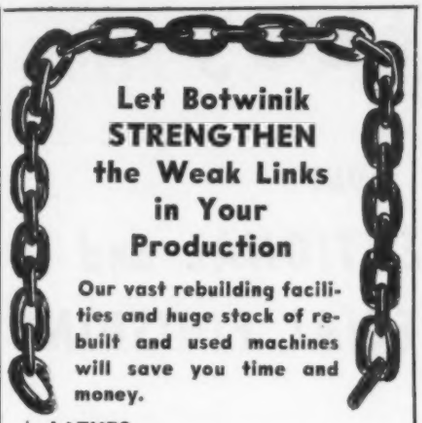

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2—Reed-Prentice 14"x6' Tool Room Lathes, sw. over bed 14½", dist. betw. cens. 31", timk. bear., taper attmt.

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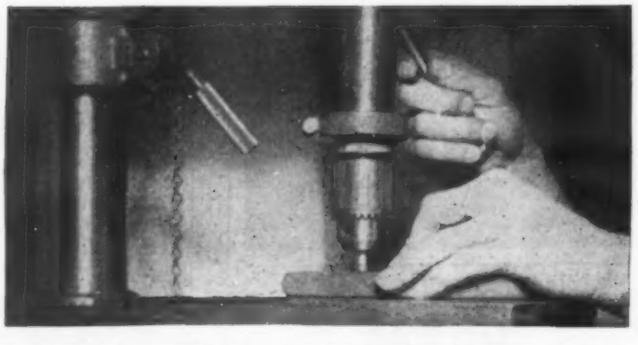

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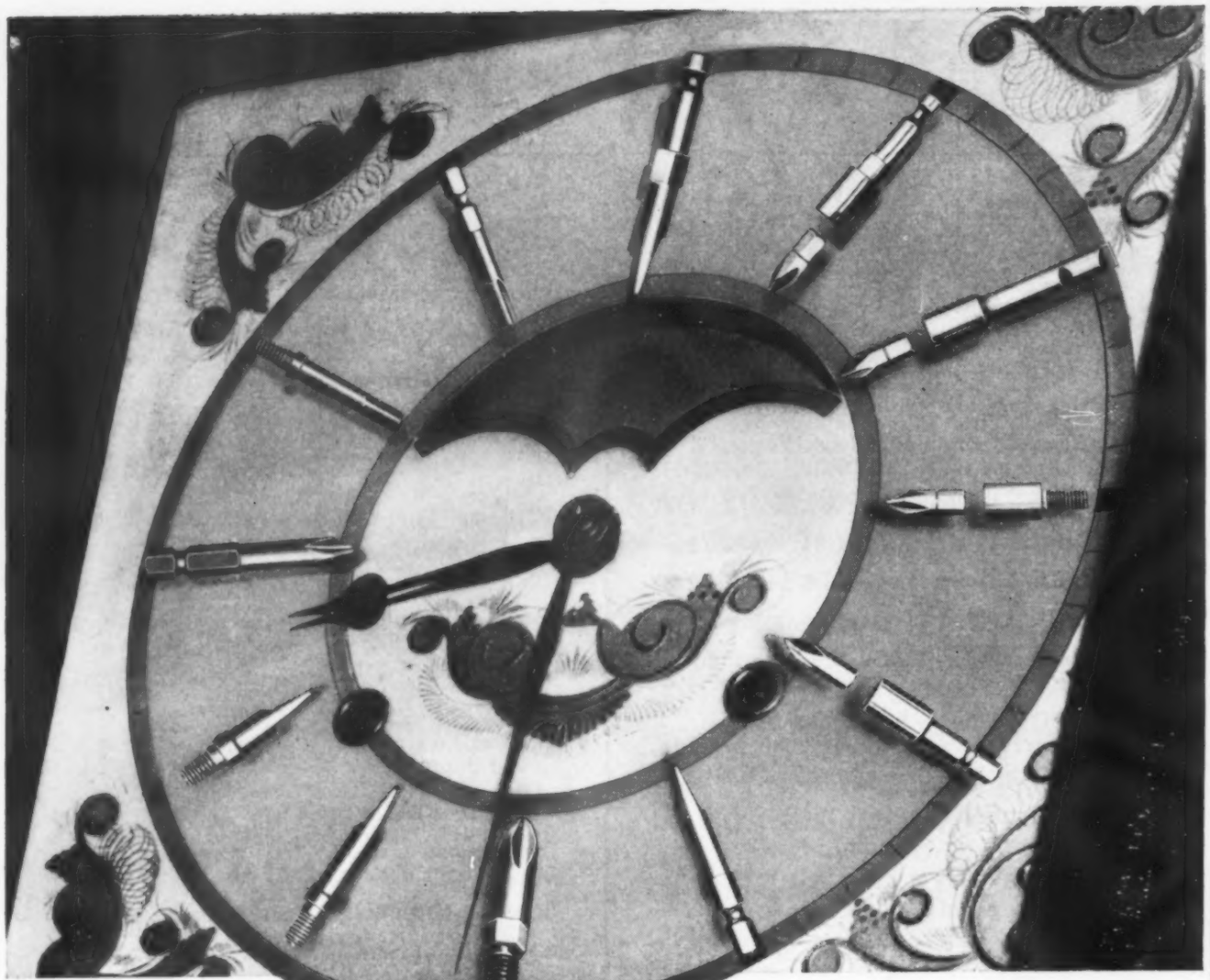

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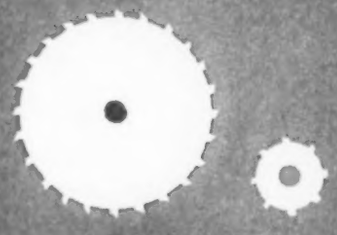

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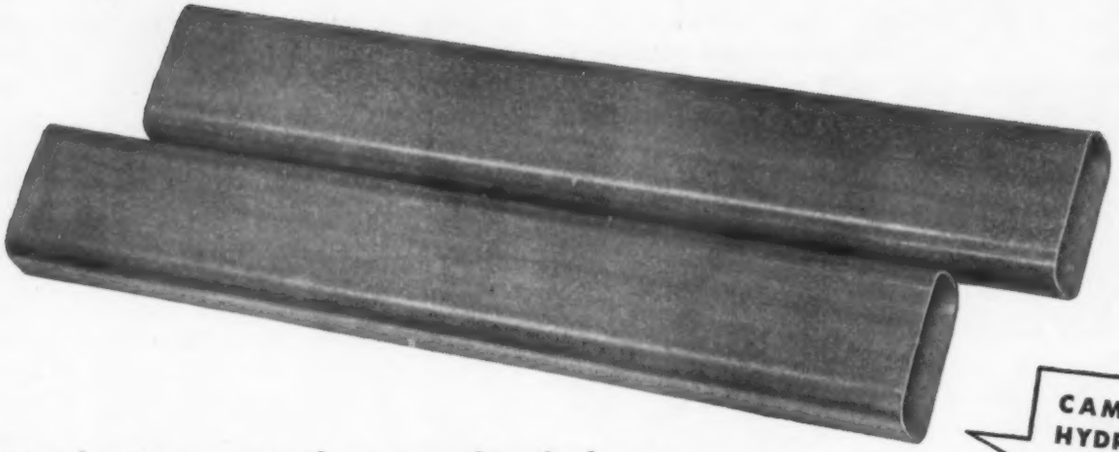

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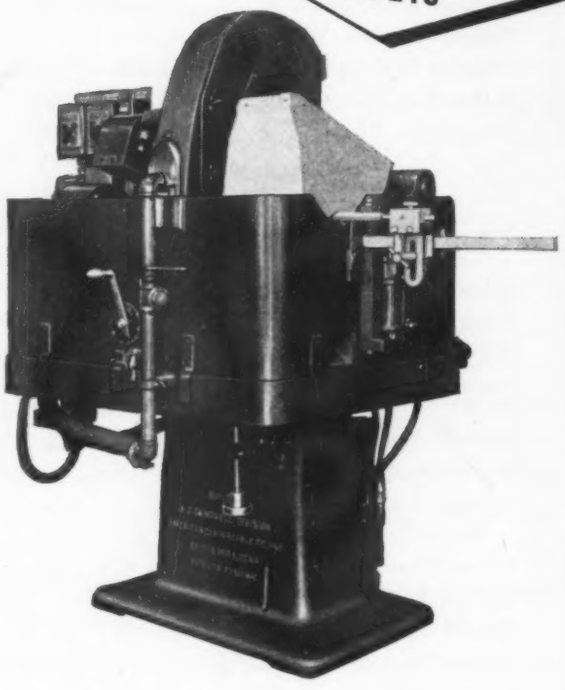

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- ***Extreme hardenability throughout cross-section***
- ***Maximum hardness of 65/66- Rockwell C when quenched in oil***
- ***High tensile strength***
- ***High fatigue strength***
- ***Excellent machinability because of fully spheroidized structure***
- ***Withstands working pressure of 200,000 lbs/square inch***

THESE are the remarkable properties of 52100 high carbon-chrome steel—made by The Steel and Tube Division of the Timken Roller Bearing Company, world's largest producers and *only* source of 52100 Steel in three finished forms—bars, tubes, and wire.

Developed primarily for the anti-friction bearing industry, Timken 52100 steel offers outstanding advantages for any machined part where great strength and exceptional wear resistance are vital. And the label "Timken" means high, uniform quality—for we control production step-by-step from melting to final inspection of the finished bars or tubing.

Timken 52100 steel forging and machining bars are produced in a wide range of sizes. 52100 seamless steel tubing is also available in a wide range of sizes, grades and finishes. And for your emergency orders, a mill stock of 52100 tubing in 99 sizes, ranging from 1″ to 10 ½″ O.D., is available for immediate shipment.

If you need a steel with these special qualities, now is the time to contact The Steel and Tube Division, The Timken Roller Bearing Co., Canton 6, Ohio.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

Announcing

A NEW TOOL ROTATING DOUBLE END CHUCKING MACHINE

Fast Index, Power Chucking, Steady High Production

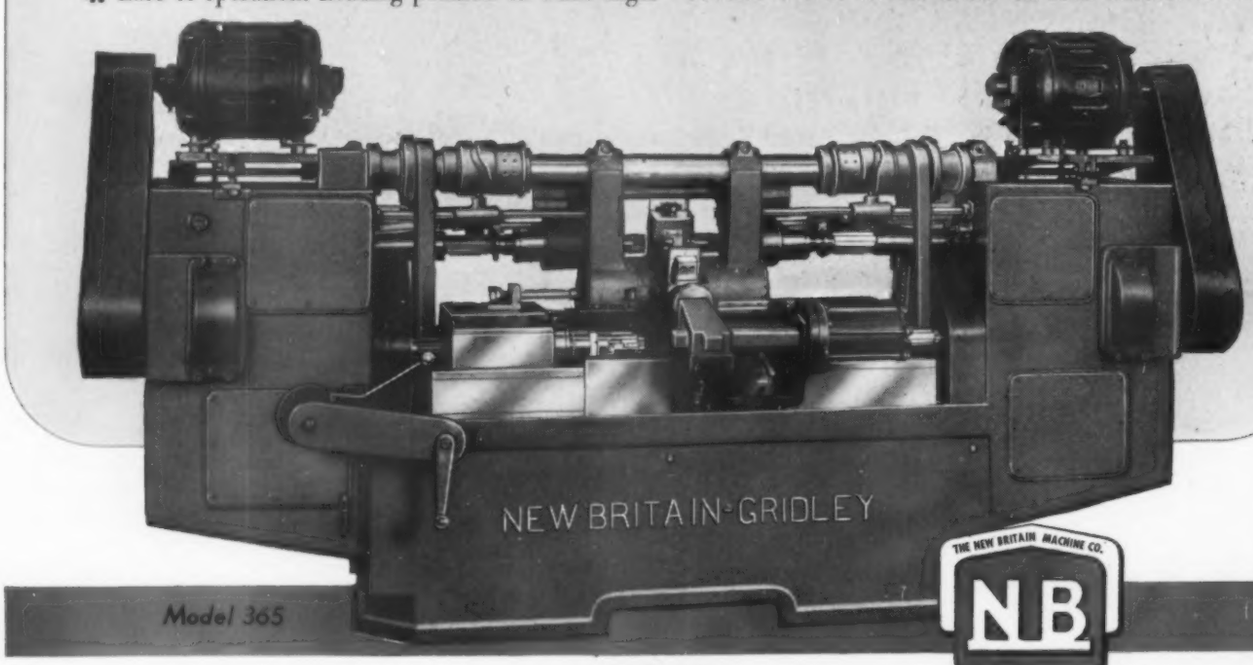
Featuring **1.** A four-chuck horizontal indexing turret with three work spindles on each side. One position for loading. Rough and finish bore, face, drill or ream in the first two positions; finish ream or thread in third position.

2. Over-all weight, power, and rigidity make possible the use of carbide tools and dampen any tendency to vibrate when running at high speeds.

3. Anti-friction spindles mounted in positionable quills carried in slides to minimize overhang. Spindle speeds up to 2,000 RPM have been provided for fast machining of non-ferrous metals.

4. Ease of operation. Loading position is waist high. All controls within easy reach of operator. Automatic chucking quickly accomplished. Many types of pieces may be magazine loaded. Until fully inter-locked safety devices are satisfied, turret will not index nor tools jump.

5. High production. Rapid jump and drawback on all feeds. Total idle time of index - 1.67 seconds. Two pieces may be finished at one chucking on some jobs. Geneva motion index and locking mechanism completely enclosed and guarded against dirt and chips. Either lead screw threading or lead cam threading to take full advantage of self-opening dies or collapsing taps available in No. 3 position. Threading spindles may have different speeds and feeds and will reverse within closest limits on each successive cut.



IN THE MIDST OF EVERYTHING AT THE SHOW

We will have one of these machines in our Booth No. 311 at the Show. We will also have a complete line of six spindle automatic screw machines, four, six and eight spindle chucking machines, a precision contour turning and boring machine, and a new revolutionary turret lathe. We'll be seeing you September 17.

M-01059

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